US009077815B1

(12) **United States Patent**
Chan et al.

(10) **Patent No.: US 9,077,815 B1**
(45) **Date of Patent: Jul. 7, 2015**

(54) **CUSTOMIZED HARDWARE SELECTION FOR A MOBILE PHONE**

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(73) Assignee: **Elwha LLC**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/632,042**

(22) Filed: **Feb. 26, 2015**

Related U.S. Application Data

(60) Continuation of application No. 13/765,505, filed on Feb. 12, 2013, now Pat. No. 8,971,969, which is a division of application No. 13/340,463, filed on Dec. 29, 2011, now Pat. No. 8,391,934.

(51) **Int. Cl.**

H04M 1/00	(2006.01)
H04M 1/725	(2006.01)
H04W 88/02	(2009.01)

(52) **U.S. Cl.**
CPC ***H04M 1/72575*** (2013.01); ***H04W 88/02*** (2013.01)

(58) **Field of Classification Search**
CPC . H04M 1/0202; H04M 1/0254; H04M 1/026; H04M 1/0266; H04M 1/04; H04M 1/72575
See application file for complete search history.

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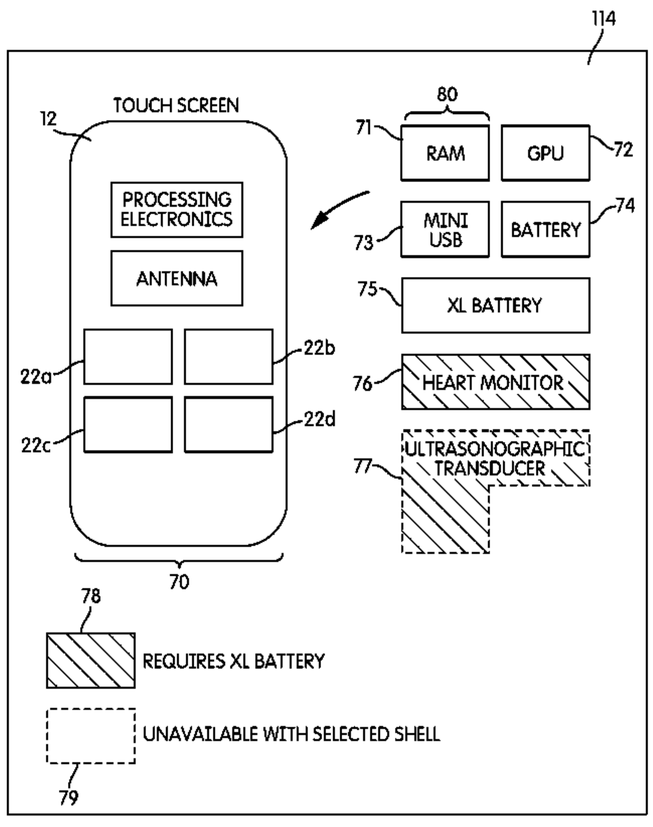
(Continued)

Primary Examiner — Kashif Siddiqui

(57) **ABSTRACT**

A computerized method of customizing hardware for a mobile phone is provided. The method includes receiving shell selection information from a user input device, identifying a set of hardware components, the set of hardware components generated based on a compatibility between the hardware components and the shell selection information, and outputting the identified set of compatible hardware components.

31 Claims, 20 Drawing Sheets



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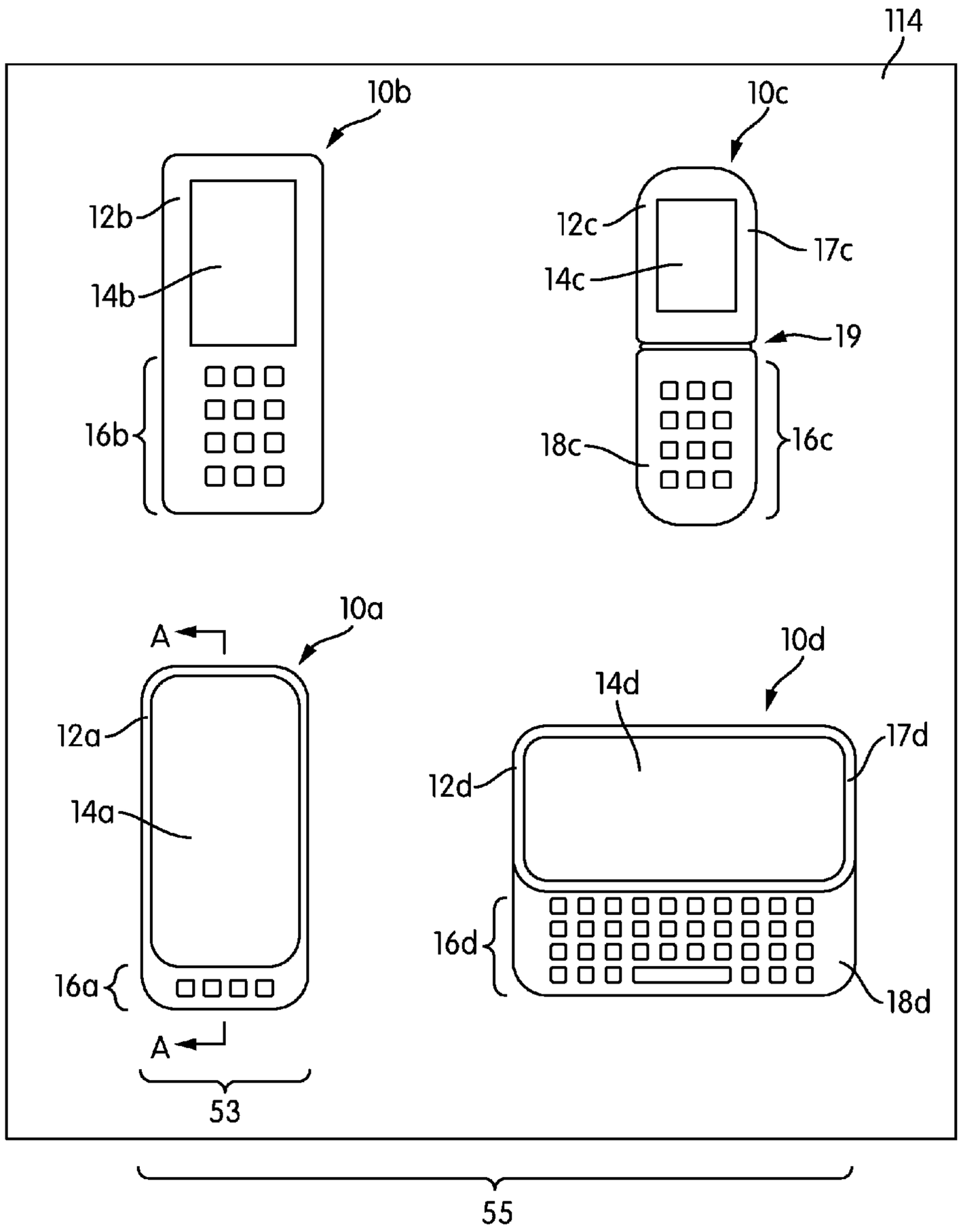
114
10b
12b
14b
16b
10c
12c
17c
14c
19
18c
16c
10a
A
12a
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16a
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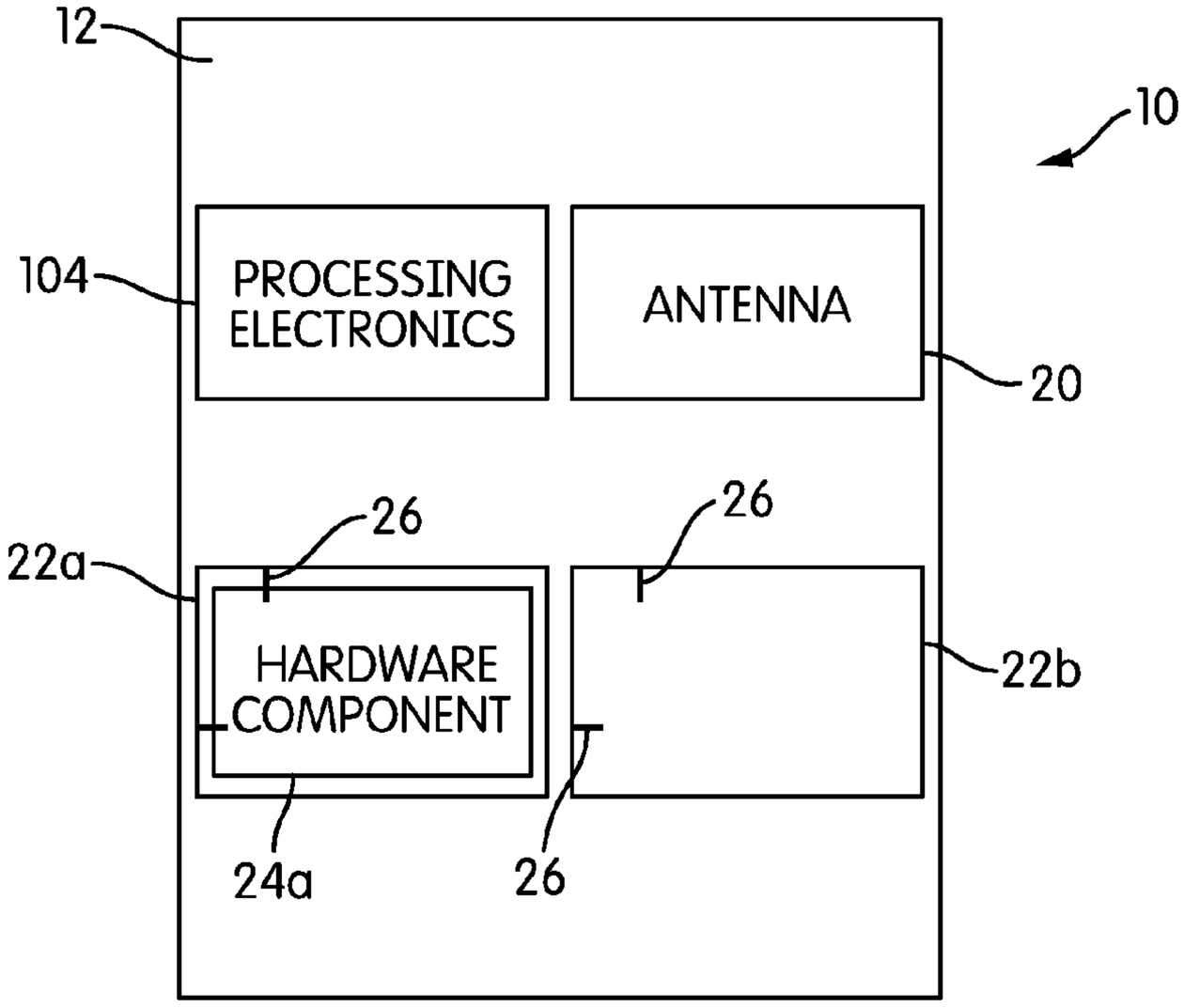
10d
14d
12d
17d
16d
18d
55

FIG. 1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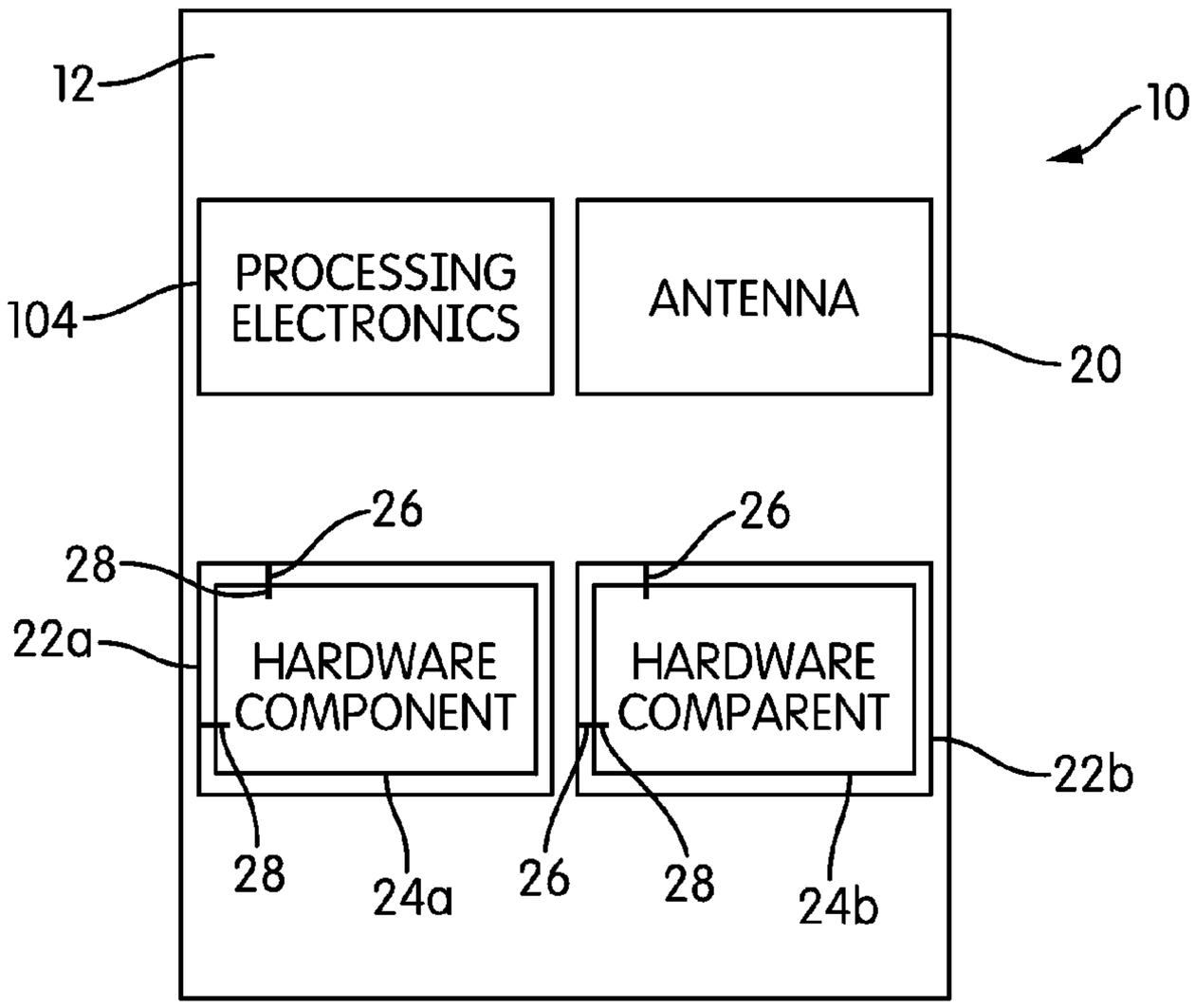
10
104
PROCESSING ELECTRONICS
ANTENNA
20
26
26
22a
HARDWARE COMPONENT
22b
24a
26

FIG. 2A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10
104
PROCESSING ELECTRONICS
ANTENNA
20
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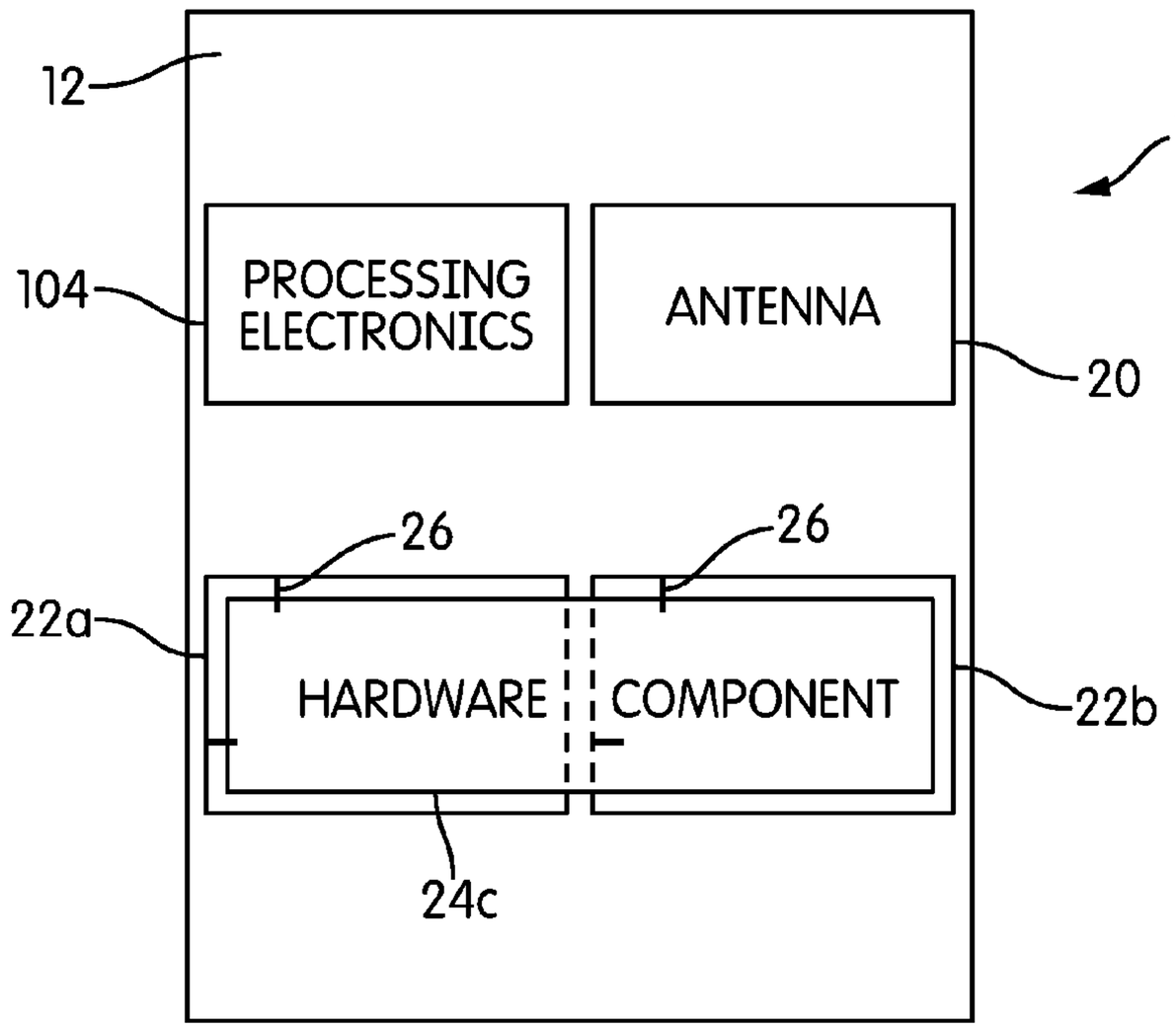
26
28
22a
HARDWARE COMPONENT
HARDWARE COMPARENT
22b
28
24a
26
28
24b

FIG. 2B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104
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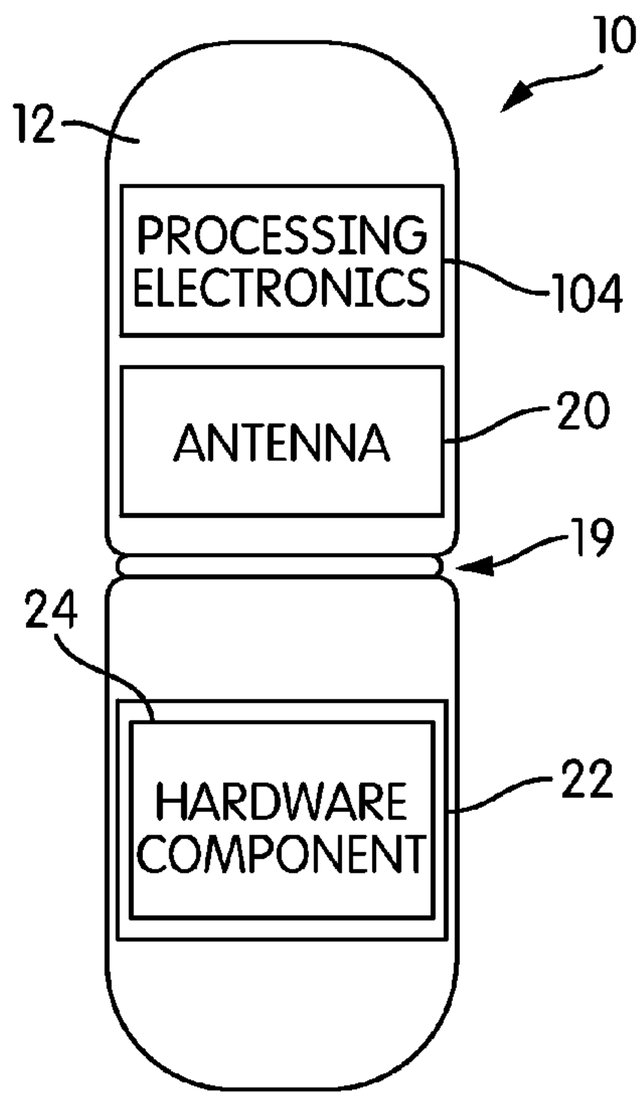
ANTENNA
20
26
26
22a
HARDWARE
COMPONENT
22b
24c

FIG. 2C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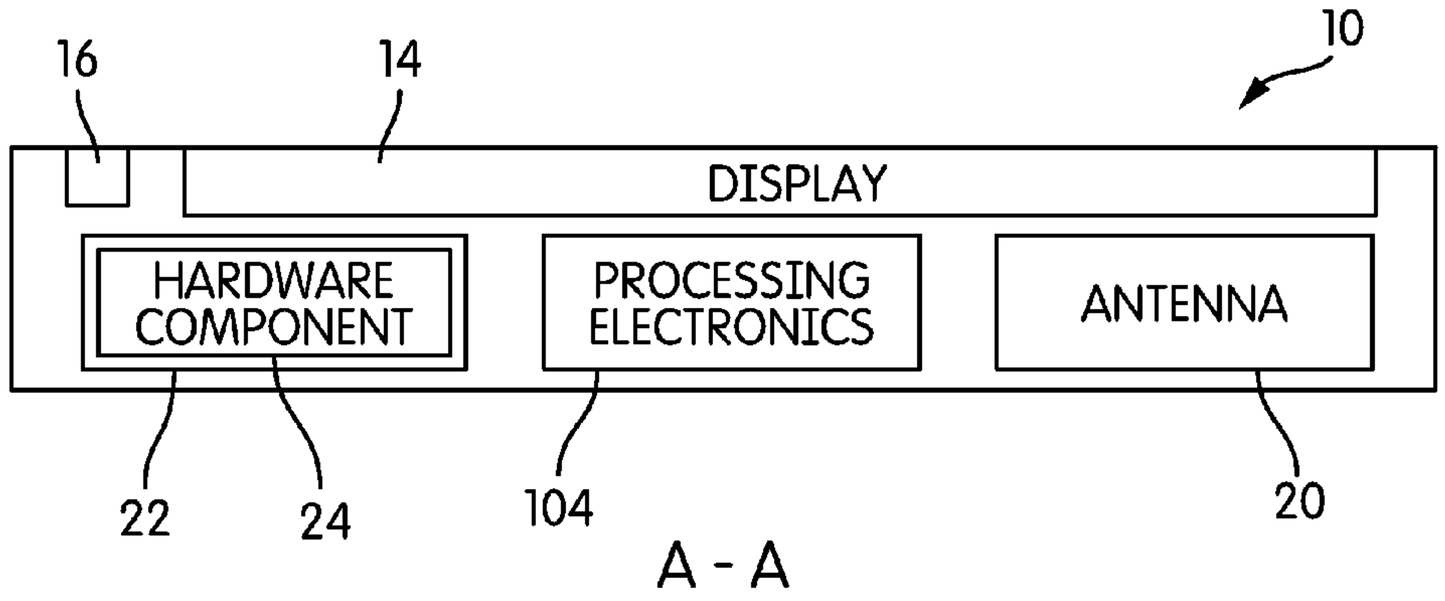
12
PROCESSING ELECTRONICS
104
ANTENNA
20
19
24
HARDWARE COMPONENT
22

FIG. 3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14
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DISPLAY
HARDWARE COMPONENT
PROCESSING ELECTRONICS
ANTENNA
22
24
104
20
A - A

FIG. 4A

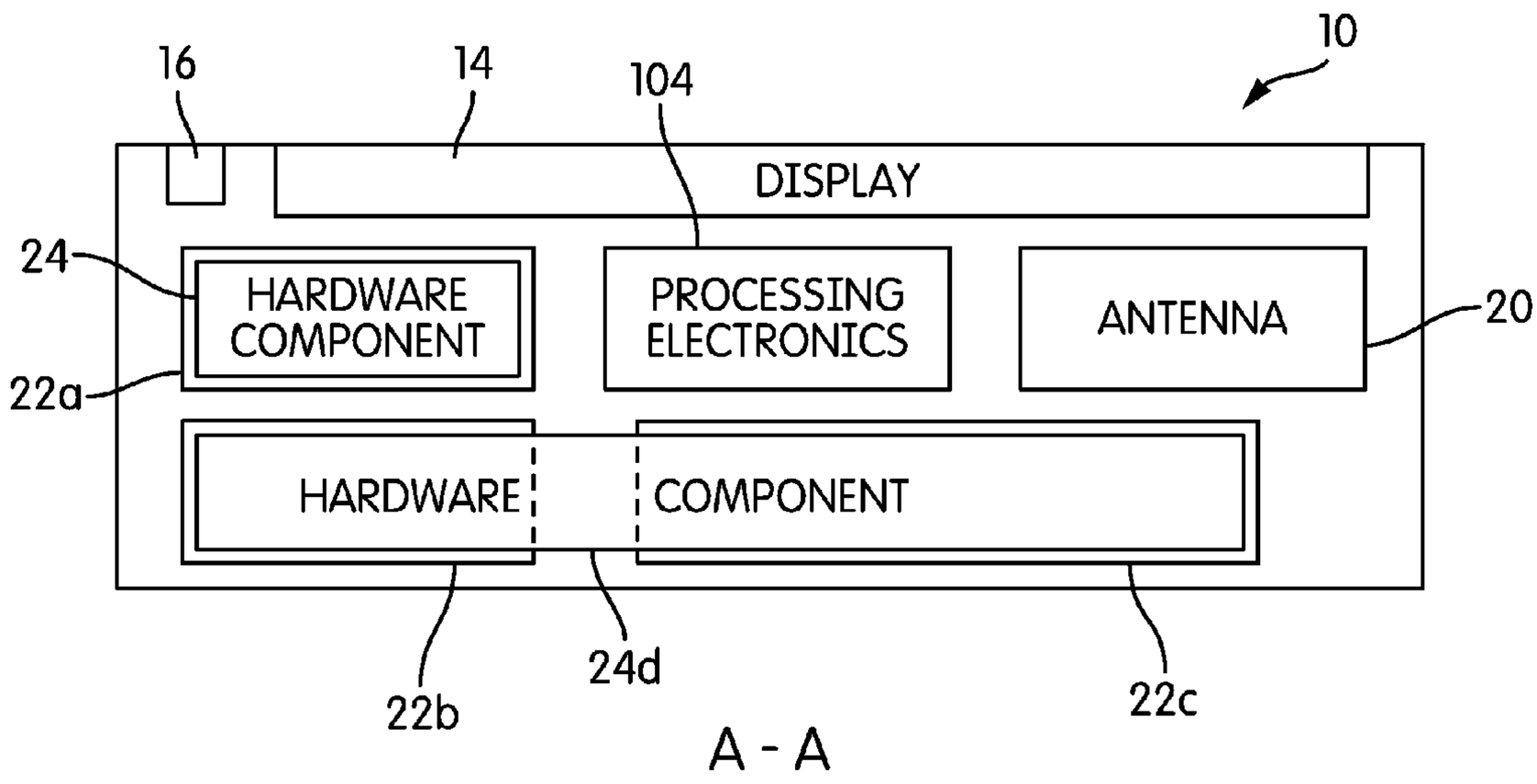
16
14
104
10
DISPLAY
24
HARDWARE COMPONENT
PROCESSING ELECTRONICS
ANTENNA
20
22a
HARDWARE
COMPONENT
22b
24d
22c
A - A

FIG. 4B

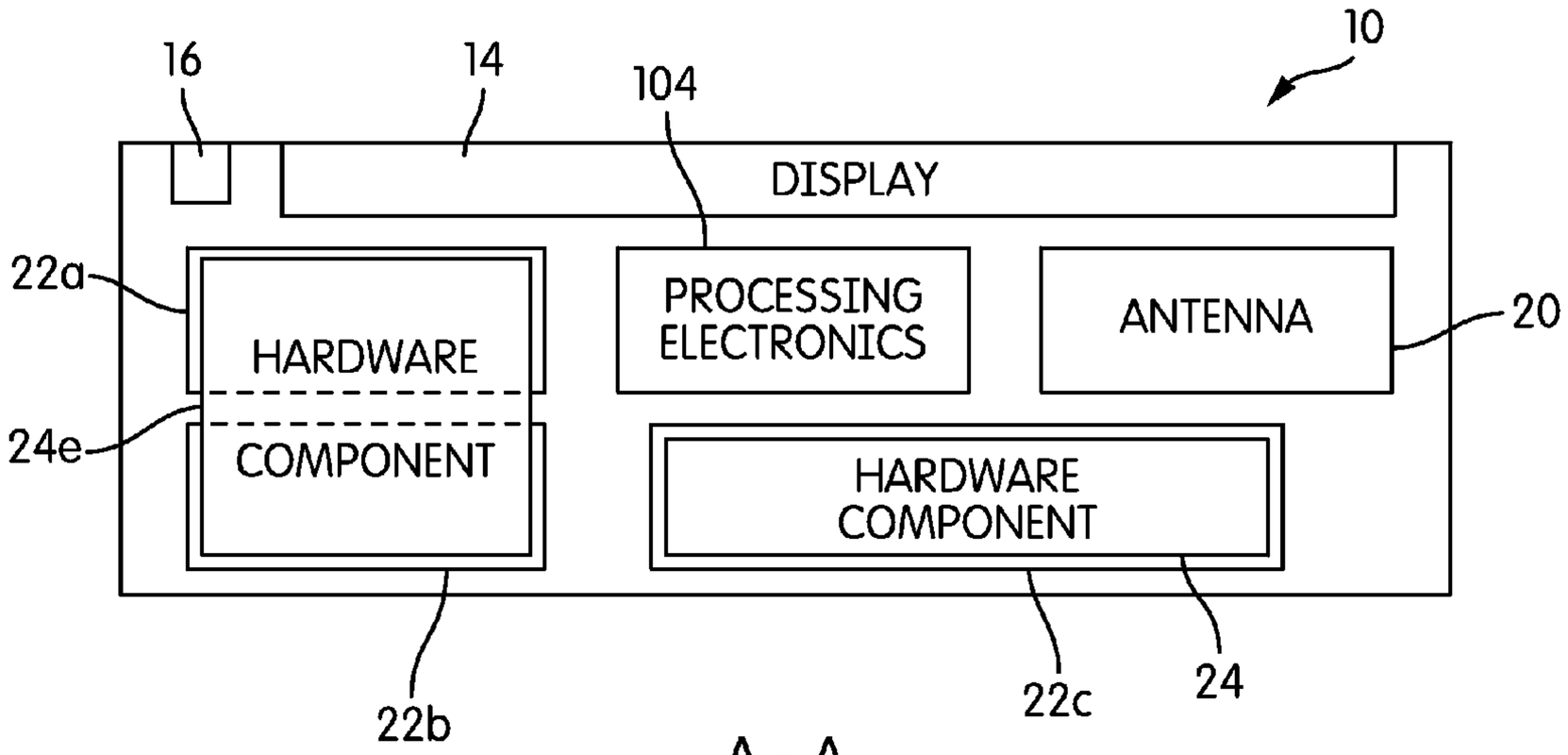
16
14
104
10
DISPLAY
22a
HARDWARE
PROCESSING ELECTRONICS
ANTENNA
20
24e
COMPONENT
HARDWARE COMPONENT
22b
22c
24
A - A

FIG. 4C

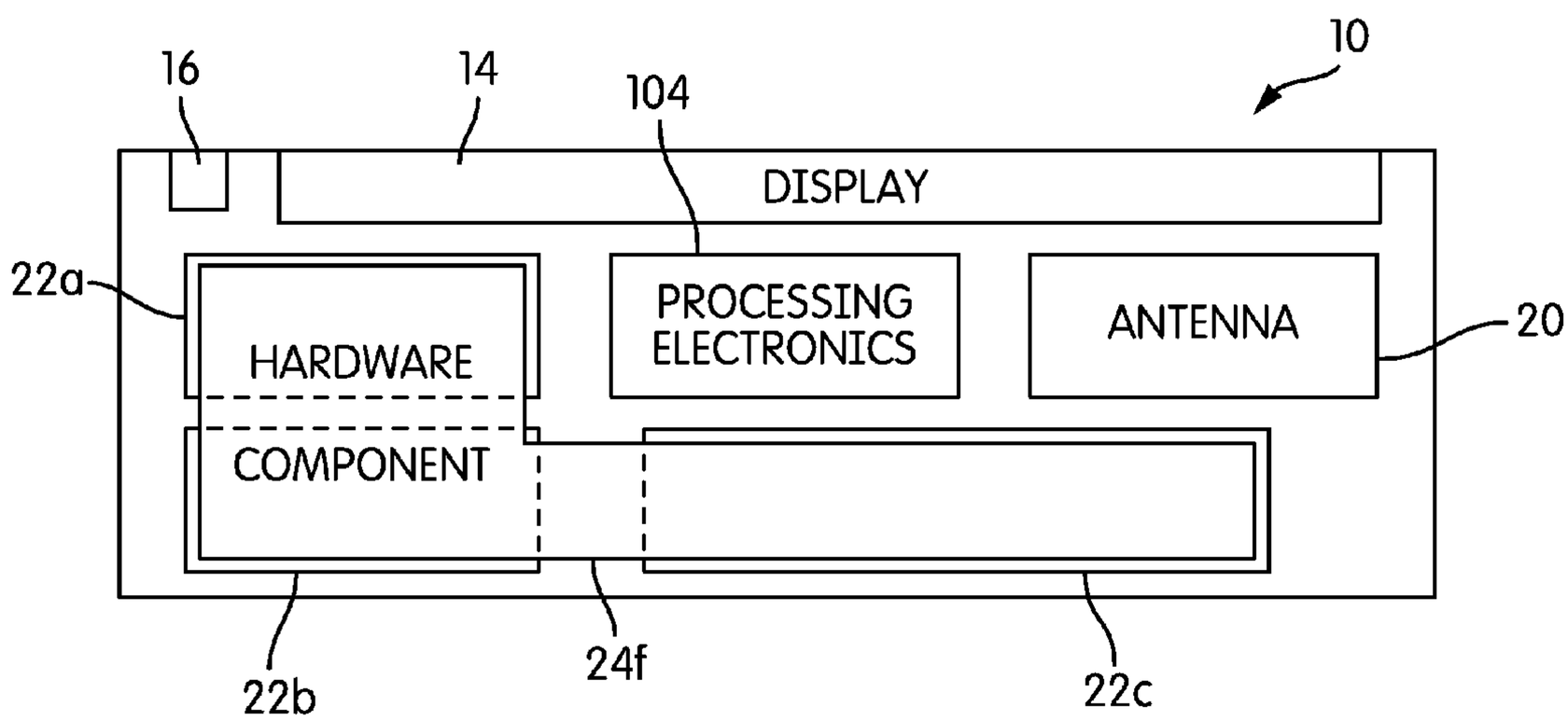
16
14
104
10
DISPLAY
22a
HARDWARE
PROCESSING ELECTRONICS
ANTENNA
20
COMPONENT
22b
24f
22c
A - A

FIG. 4D

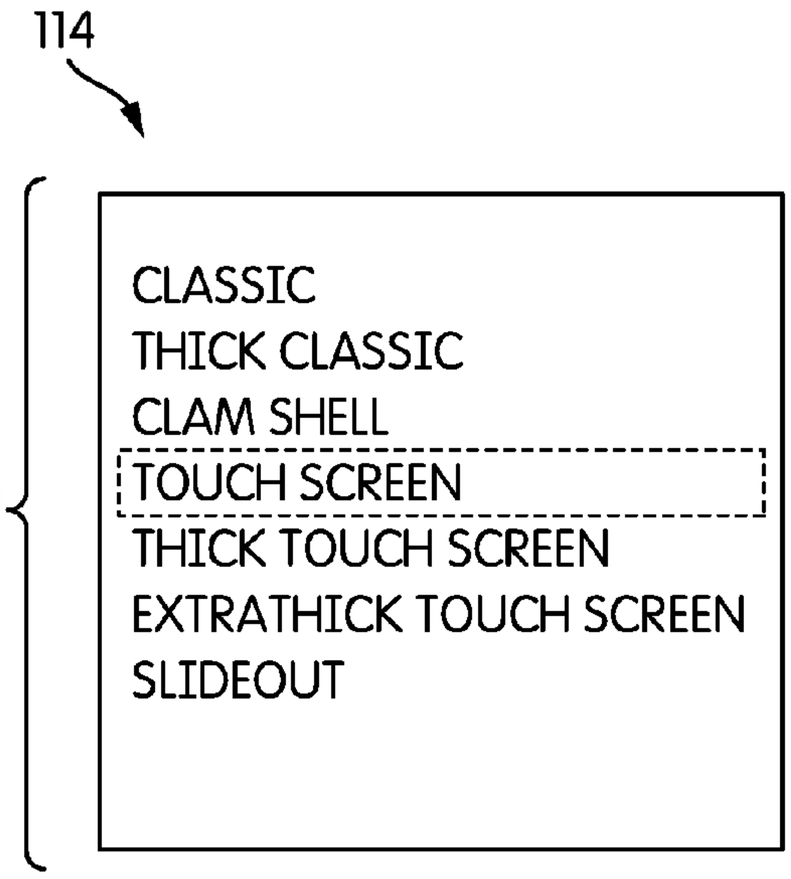

FIG. 5

114

63

61

ITEM	NO. OF RECEIVERS	THICKNESS	RATINGS
RAM	1	THIN	5
GPU	1	THIN	3
USB PORT	1	THIN	4.4
ULTRA SOUND	3	THICK	4
HEART MONITOR	2	THICK	4.3
MAG STRIPE READER	2	THICK	2
USB PORT	1	THICK	1
AUDIO COMBO	2	THIN	3
USB-HDMI COMBO	1-2	THIN	3.5

FIG. 6

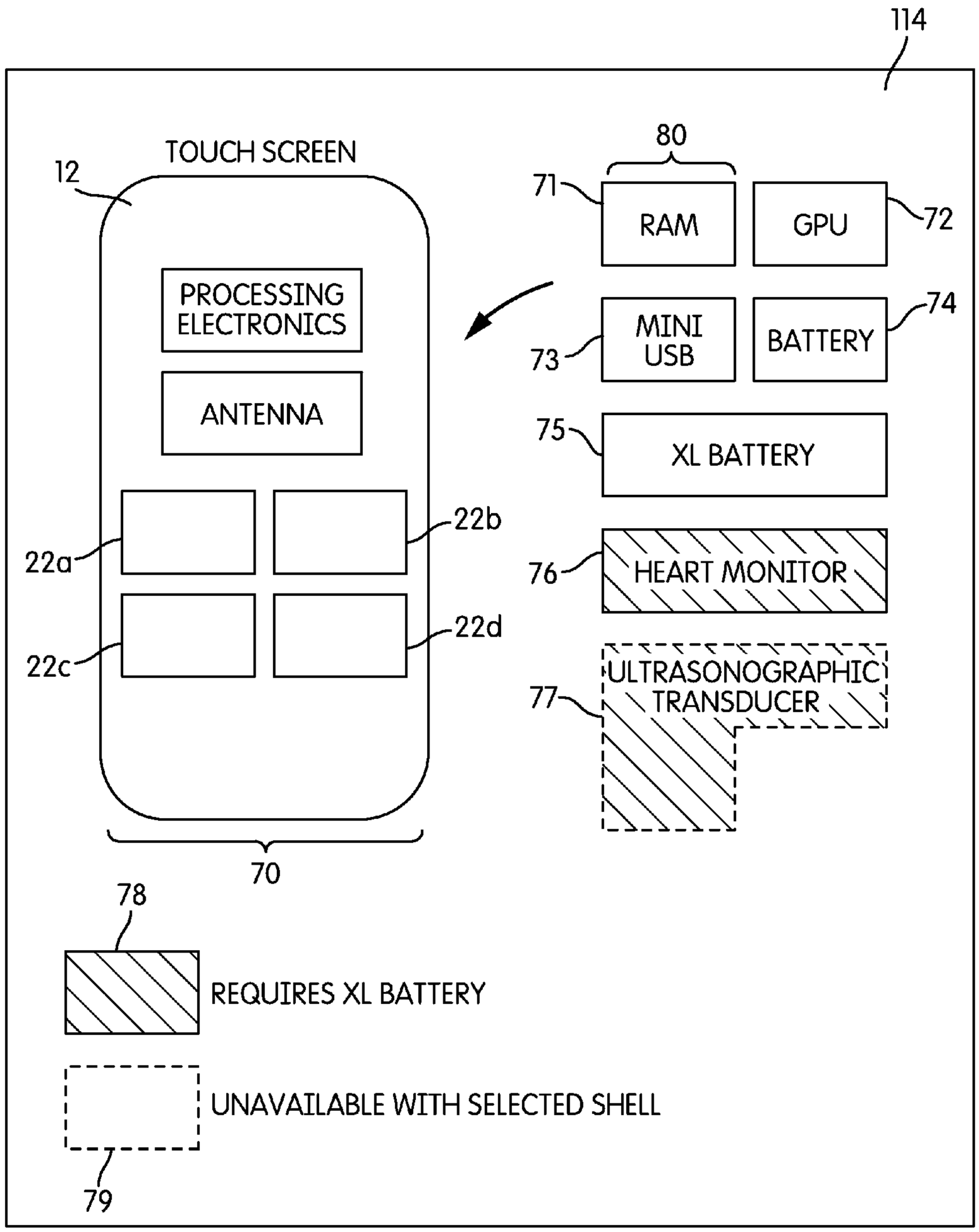
114
TOUCH SCREEN
12
PROCESSING ELECTRONICS
ANTENNA
22a
22b
22c
22d
70
80
71
RAM
GPU
72
MINI USB
73
BATTERY
74
75
XL BATTERY
76
HEART MONITOR
ULTRASONOGRAPHIC TRANSDUCER
77
78
REQUIRES XL BATTERY
79
UNAVAILABLE WITH SELECTED SHELL

FIG. 7

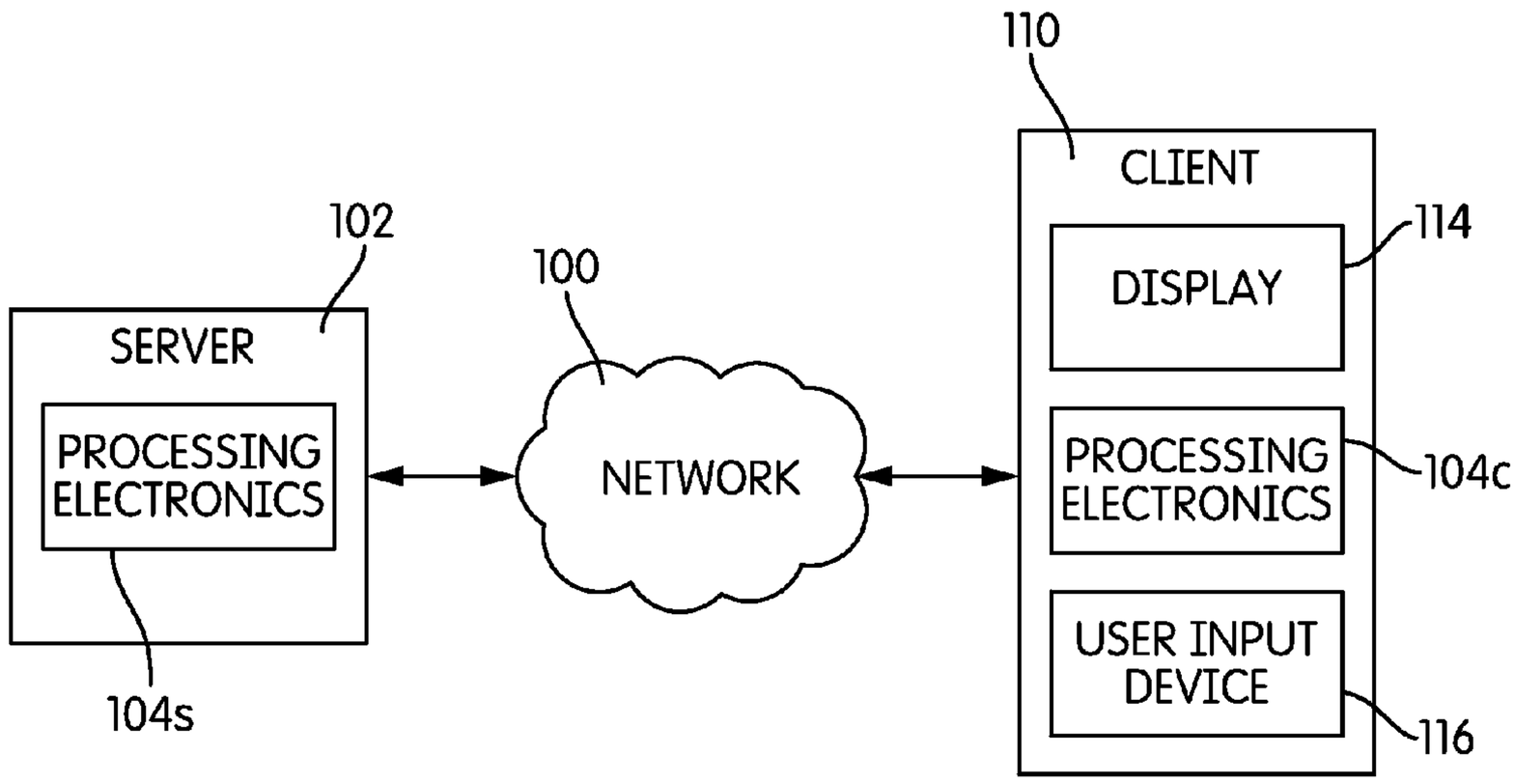
110
CLIENT
114
DISPLAY
104c
PROCESSING ELECTRONICS
USER INPUT DEVICE
116
102
SERVER
PROCESSING ELECTRONICS
104s
100
NETWORK

FIG. 8

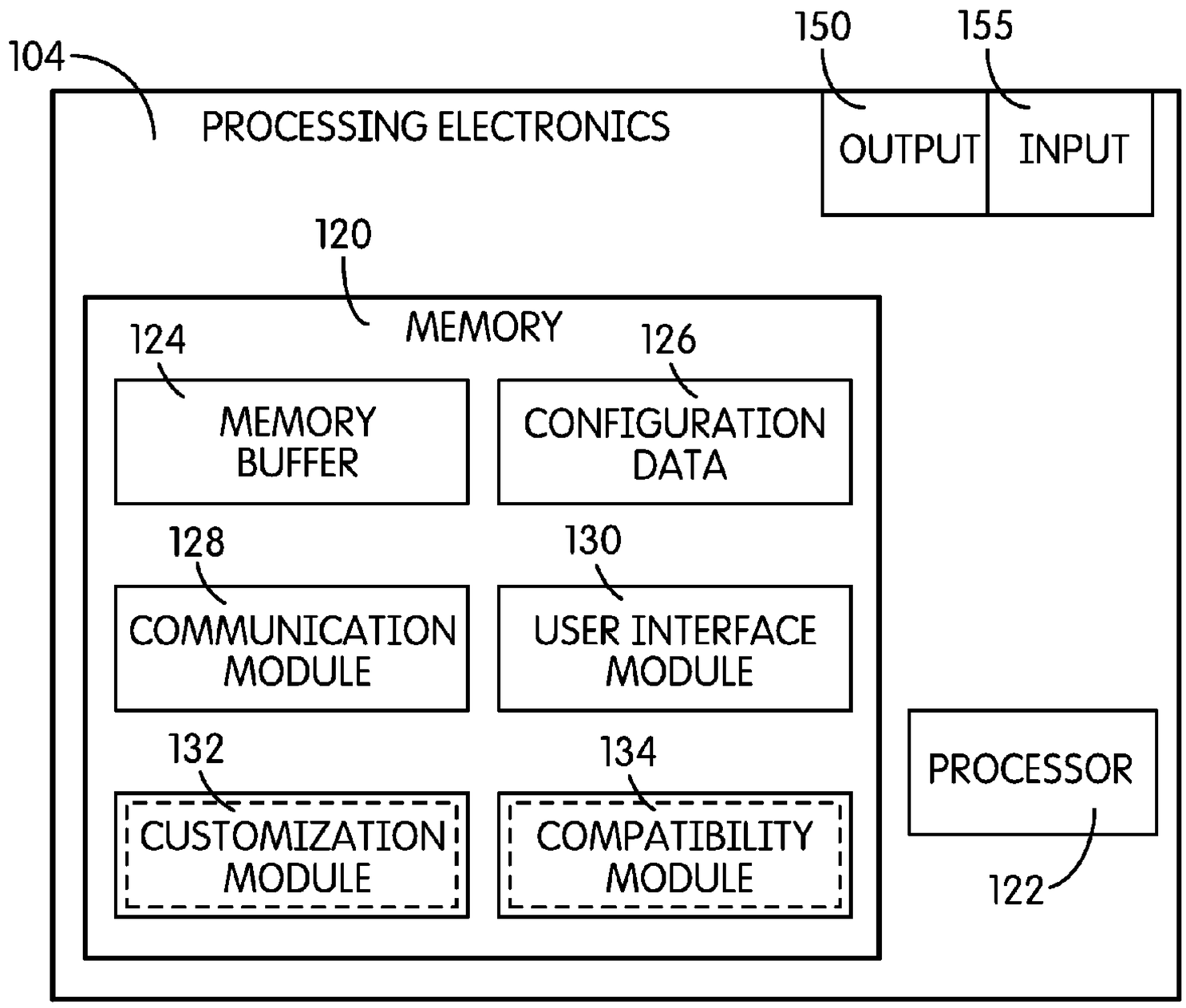
104
PROCESSING ELECTRONICS
150
OUTPUT
155
INPUT
120
MEMORY
124
MEMORY BUFFER
126
CONFIGURATION DATA
128
COMMUNICATION MODULE
130
USER INTERFACE MODULE
132
CUSTOMIZATION MODULE
134
COMPATIBILITY MODULE
PROCESSOR
122

FIG. 9

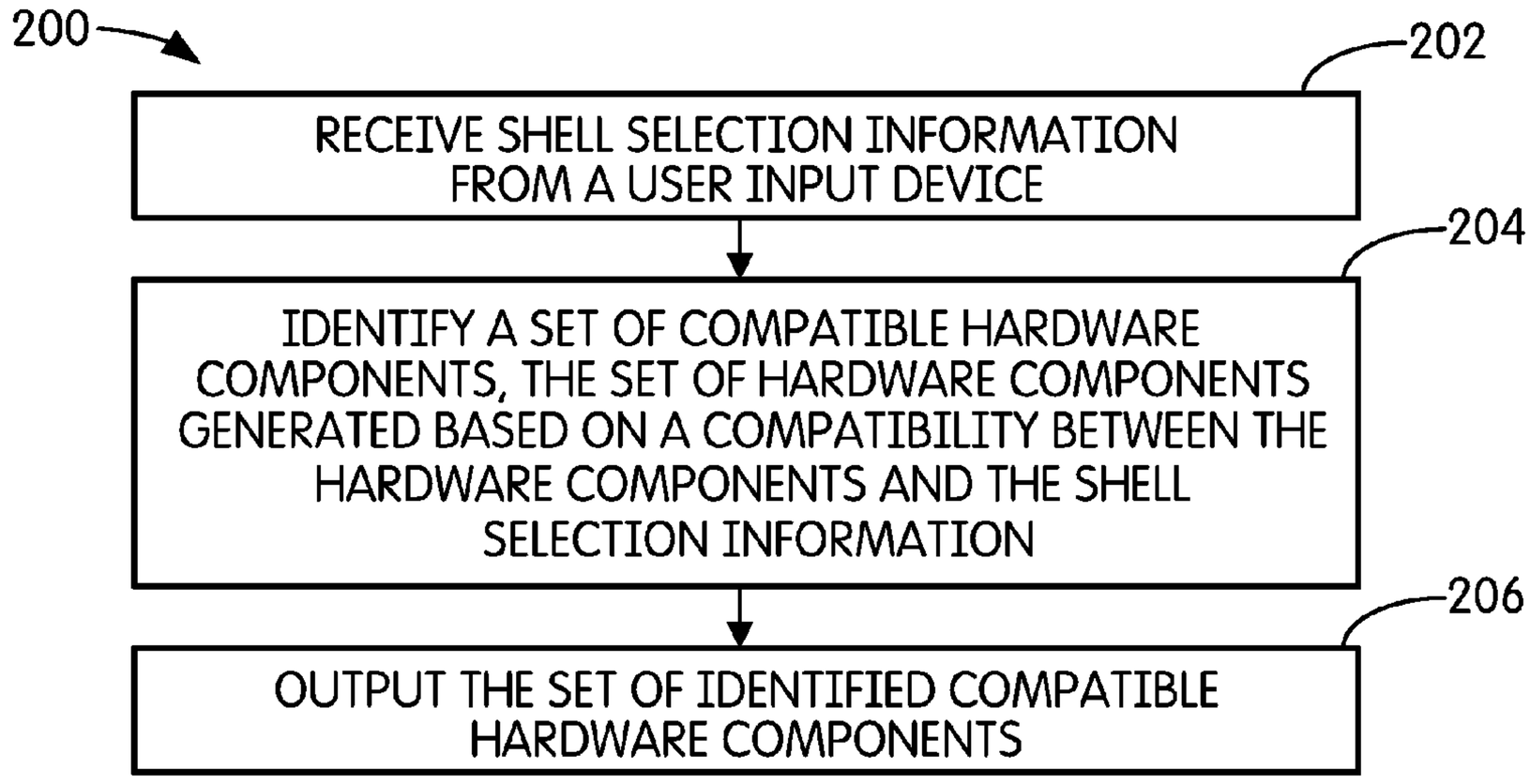
200
202
RECEIVE SHELL SELECTION INFORMATION FROM A USER INPUT DEVICE
204
IDENTIFY A SET OF COMPATIBLE HARDWARE COMPONENTS, THE SET OF HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE HARDWARE COMPONENTS AND THE SHELL SELECTION INFORMATION
206
OUTPUT THE SET OF IDENTIFIED COMPATIBLE HARDWARE COMPONENTS

FIG. 10

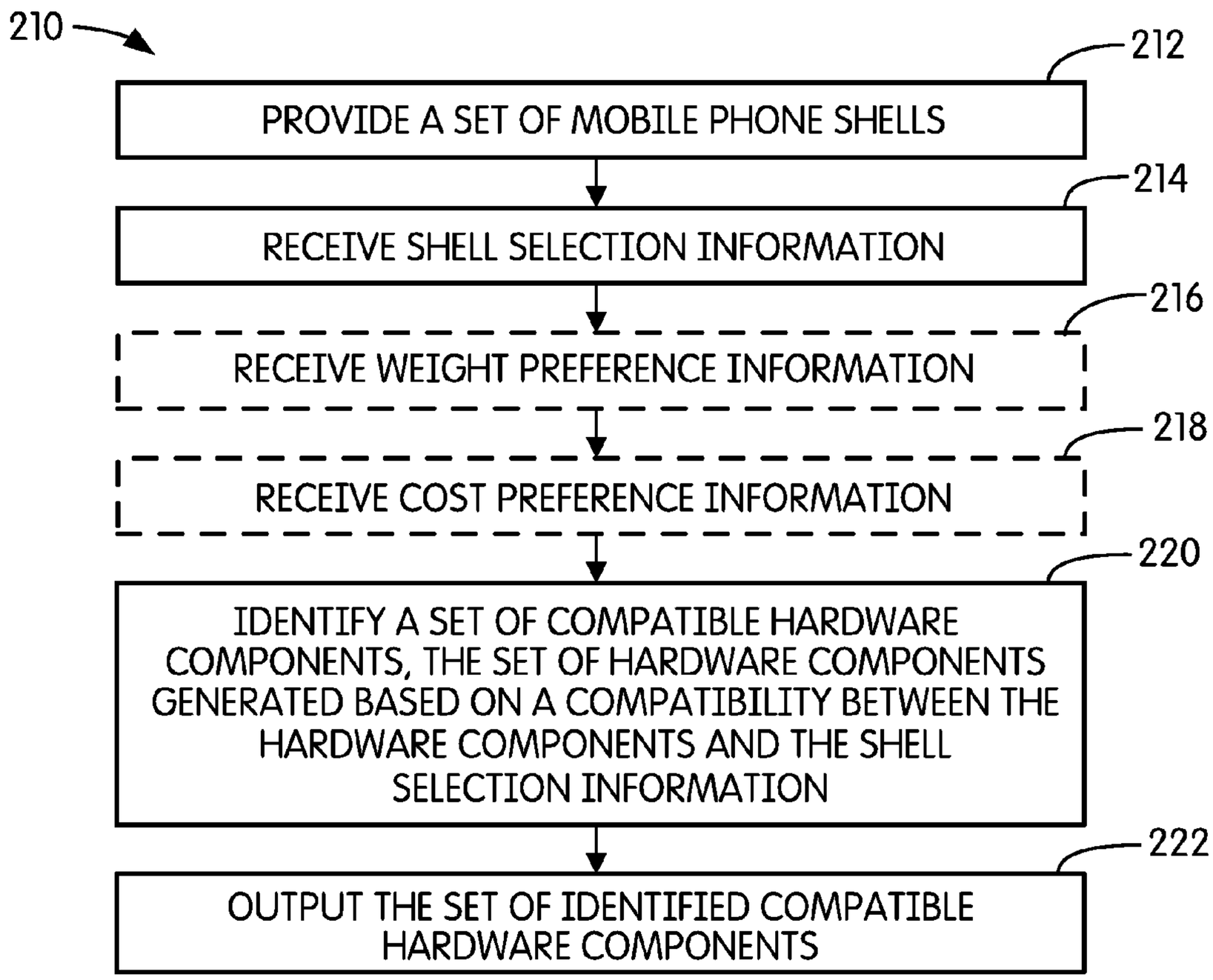
210
212
PROVIDE A SET OF MOBILE PHONE SHELLS
214
RECEIVE SHELL SELECTION INFORMATION
216
RECEIVE WEIGHT PREFERENCE INFORMATION
218
RECEIVE COST PREFERENCE INFORMATION
220
IDENTIFY A SET OF COMPATIBLE HARDWARE COMPONENTS, THE SET OF HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE HARDWARE COMPONENTS AND THE SHELL SELECTION INFORMATION
222
OUTPUT THE SET OF IDENTIFIED COMPATIBLE HARDWARE COMPONENTS

FIG. 11

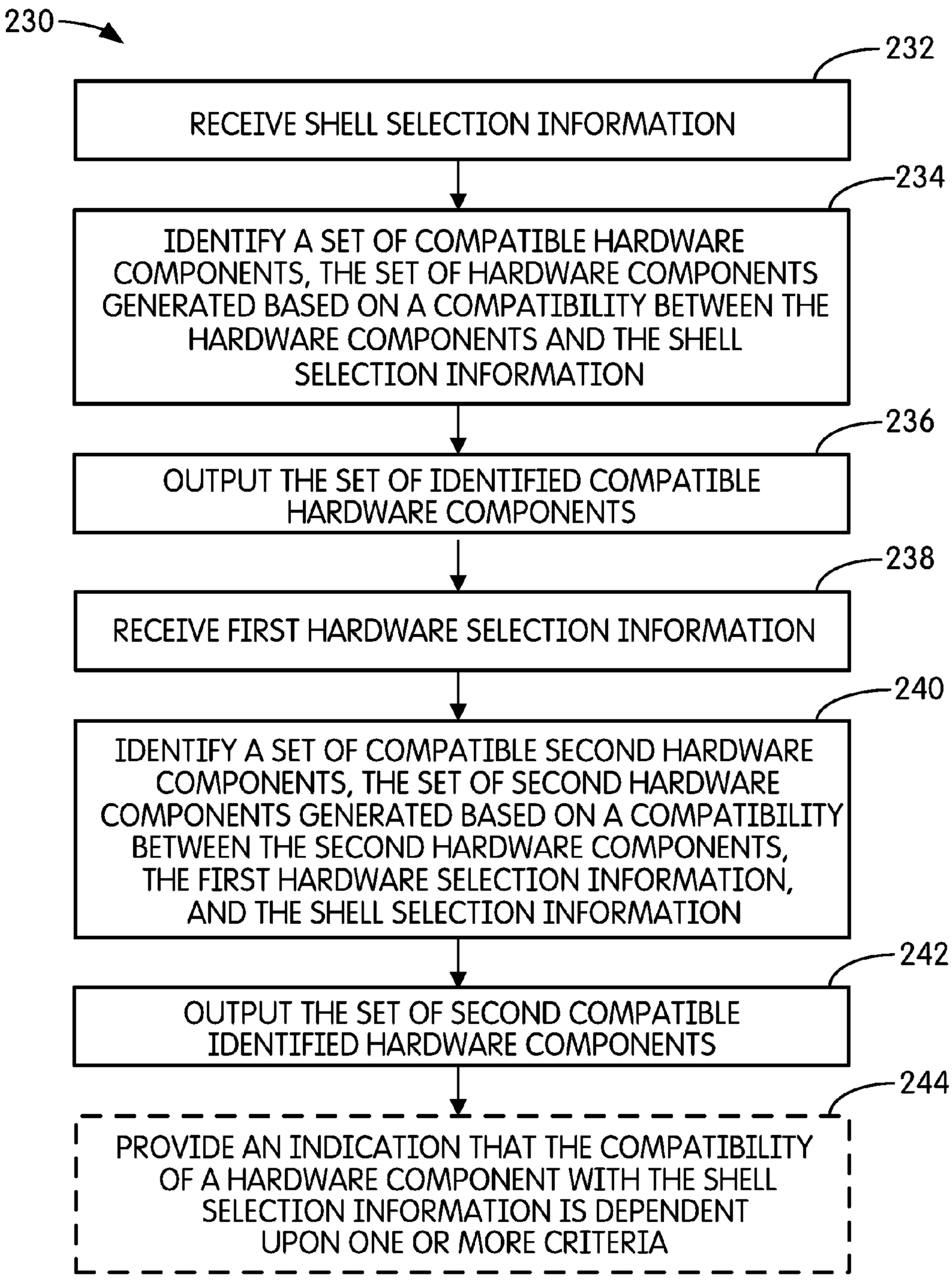
230
232
RECEIVE SHELL SELECTION INFORMATION
234
IDENTIFY A SET OF COMPATIBLE HARDWARE COMPONENTS, THE SET OF HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE HARDWARE COMPONENTS AND THE SHELL SELECTION INFORMATION
236
OUTPUT THE SET OF IDENTIFIED COMPATIBLE HARDWARE COMPONENTS
238
RECEIVE FIRST HARDWARE SELECTION INFORMATION
240
IDENTIFY A SET OF COMPATIBLE SECOND HARDWARE COMPONENTS, THE SET OF SECOND HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SECOND HARDWARE COMPONENTS, THE FIRST HARDWARE SELECTION INFORMATION, AND THE SHELL SELECTION INFORMATION
242
OUTPUT THE SET OF SECOND COMPATIBLE IDENTIFIED HARDWARE COMPONENTS
244
PROVIDE AN INDICATION THAT THE COMPATIBILITY OF A HARDWARE COMPONENT WITH THE SHELL SELECTION INFORMATION IS DEPENDENT UPON ONE OR MORE CRITERIA

FIG. 12

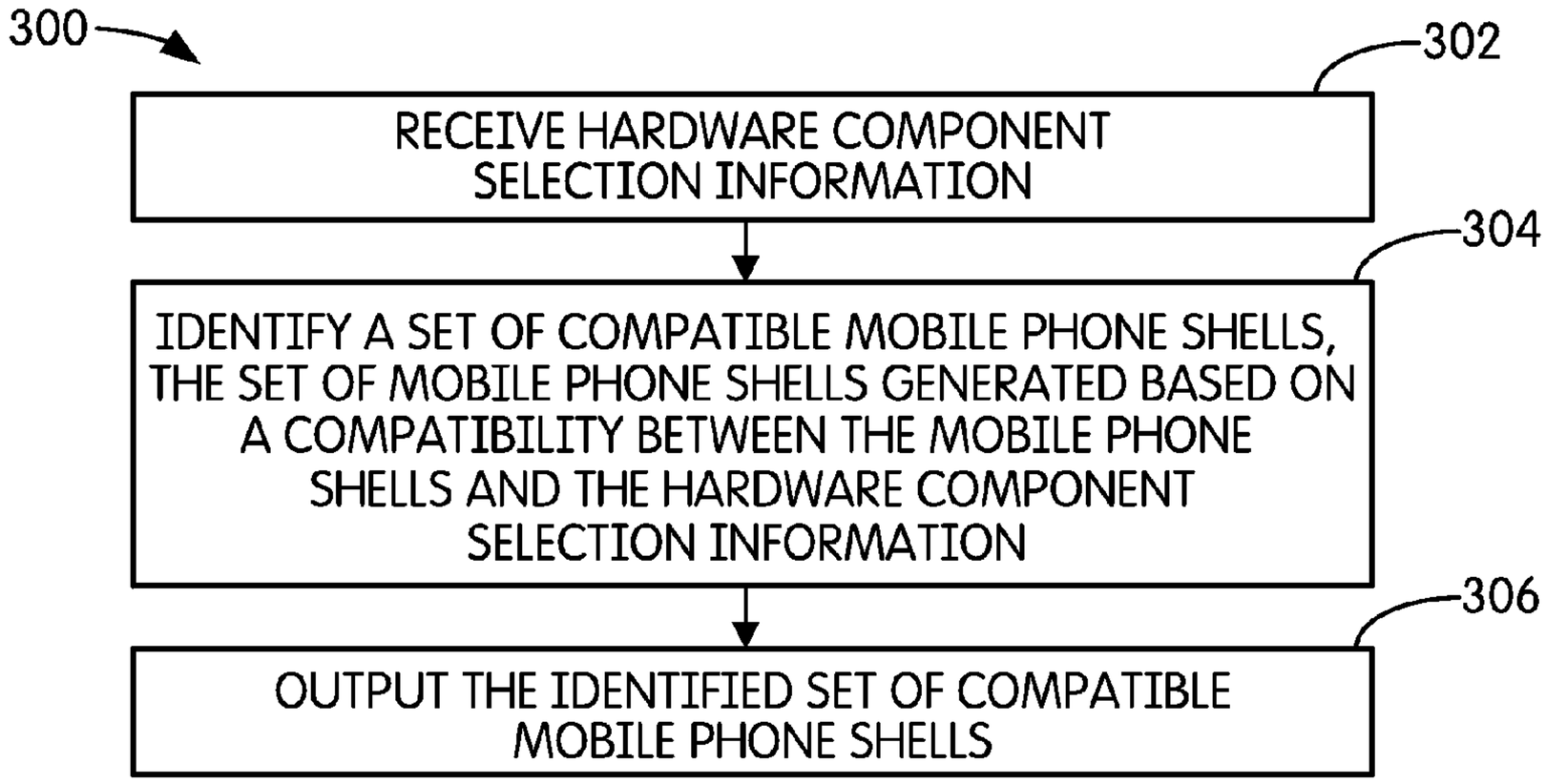
300
302
RECEIVE HARDWARE COMPONENT SELECTION INFORMATION
304
IDENTIFY A SET OF COMPATIBLE MOBILE PHONE SHELLS, THE SET OF MOBILE PHONE SHELLS GENERATED BASED ON A COMPATIBILITY BETWEEN THE MOBILE PHONE SHELLS AND THE HARDWARE COMPONENT SELECTION INFORMATION
306
OUTPUT THE IDENTIFIED SET OF COMPATIBLE MOBILE PHONE SHELLS

FIG. 13

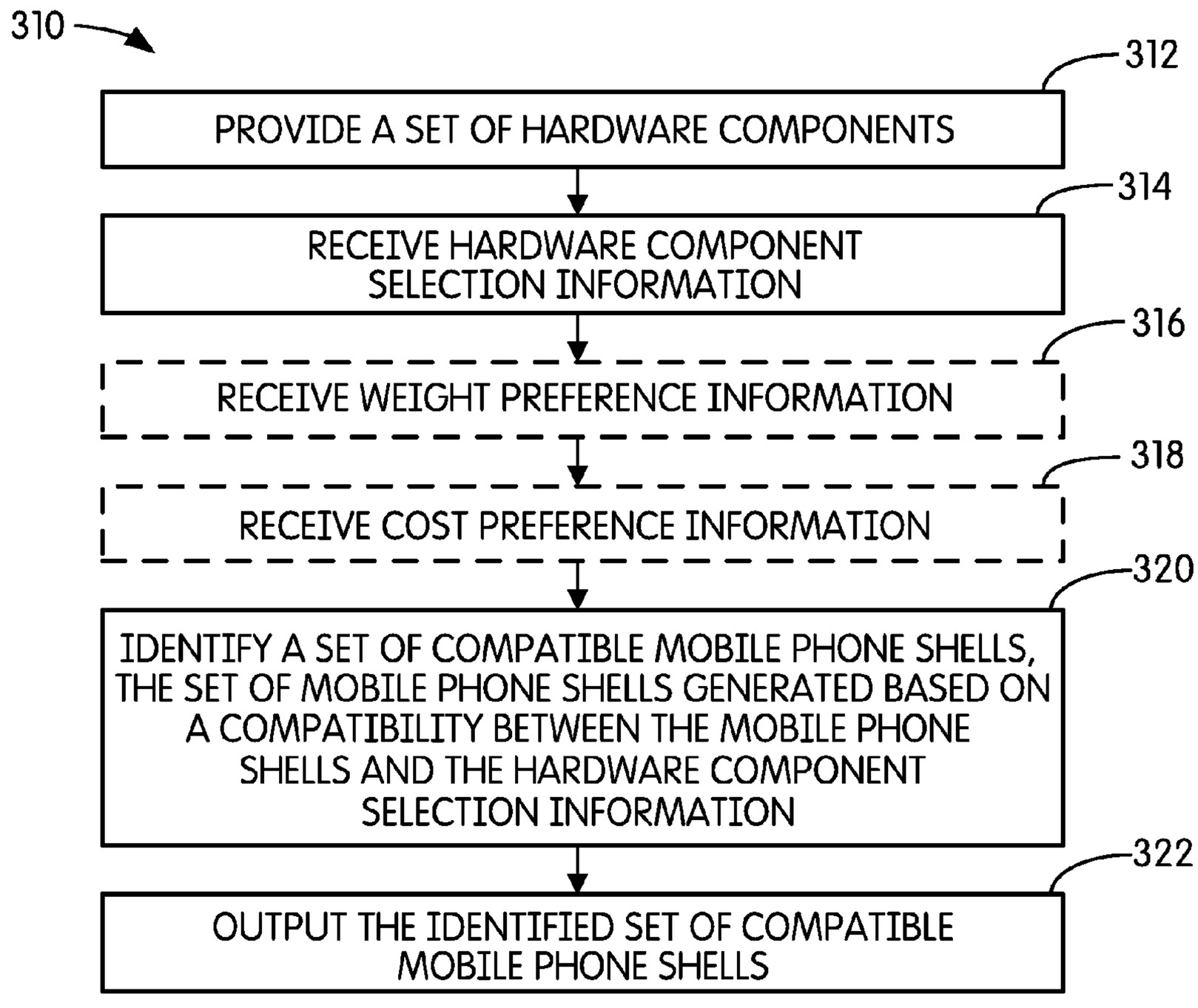
310
312
PROVIDE A SET OF HARDWARE COMPONENTS
314
RECEIVE HARDWARE COMPONENT SELECTION INFORMATION
316
RECEIVE WEIGHT PREFERENCE INFORMATION
318
RECEIVE COST PREFERENCE INFORMATION
320
IDENTIFY A SET OF COMPATIBLE MOBILE PHONE SHELLS, THE SET OF MOBILE PHONE SHELLS GENERATED BASED ON A COMPATIBILITY BETWEEN THE MOBILE PHONE SHELLS AND THE HARDWARE COMPONENT SELECTION INFORMATION
322
OUTPUT THE IDENTIFIED SET OF COMPATIBLE MOBILE PHONE SHELLS

FIG. 14

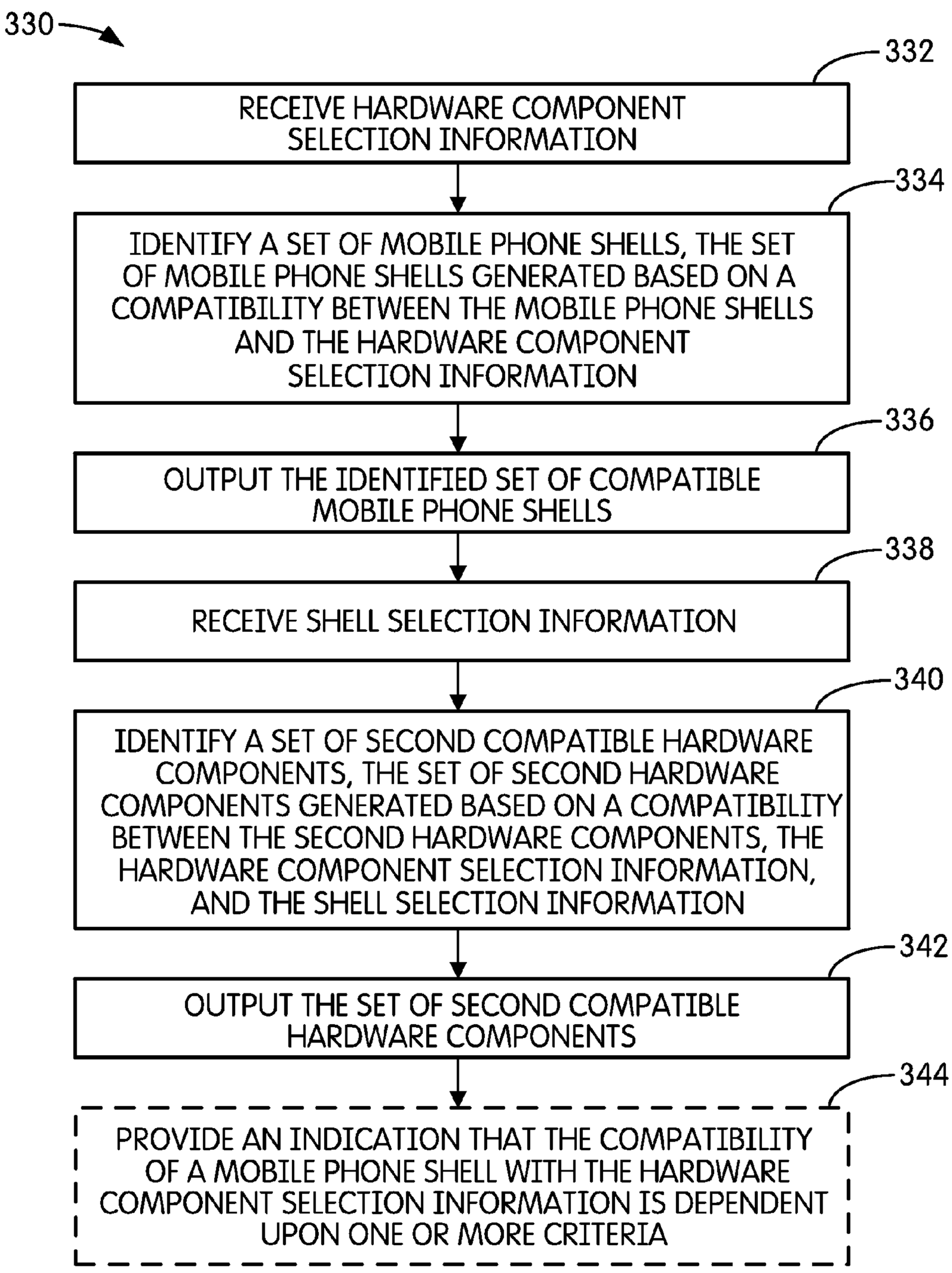
330
332
RECEIVE HARDWARE COMPONENT SELECTION INFORMATION
334
IDENTIFY A SET OF MOBILE PHONE SHELLS, THE SET OF MOBILE PHONE SHELLS GENERATED BASED ON A COMPATIBILITY BETWEEN THE MOBILE PHONE SHELLS AND THE HARDWARE COMPONENT SELECTION INFORMATION
336
OUTPUT THE IDENTIFIED SET OF COMPATIBLE MOBILE PHONE SHELLS
338
RECEIVE SHELL SELECTION INFORMATION
340
IDENTIFY A SET OF SECOND COMPATIBLE HARDWARE COMPONENTS, THE SET OF SECOND HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SECOND HARDWARE COMPONENTS, THE HARDWARE COMPONENT SELECTION INFORMATION, AND THE SHELL SELECTION INFORMATION
342
OUTPUT THE SET OF SECOND COMPATIBLE HARDWARE COMPONENTS
344
PROVIDE AN INDICATION THAT THE COMPATIBILITY OF A MOBILE PHONE SHELL WITH THE HARDWARE COMPONENT SELECTION INFORMATION IS DEPENDENT UPON ONE OR MORE CRITERIA

FIG. 15

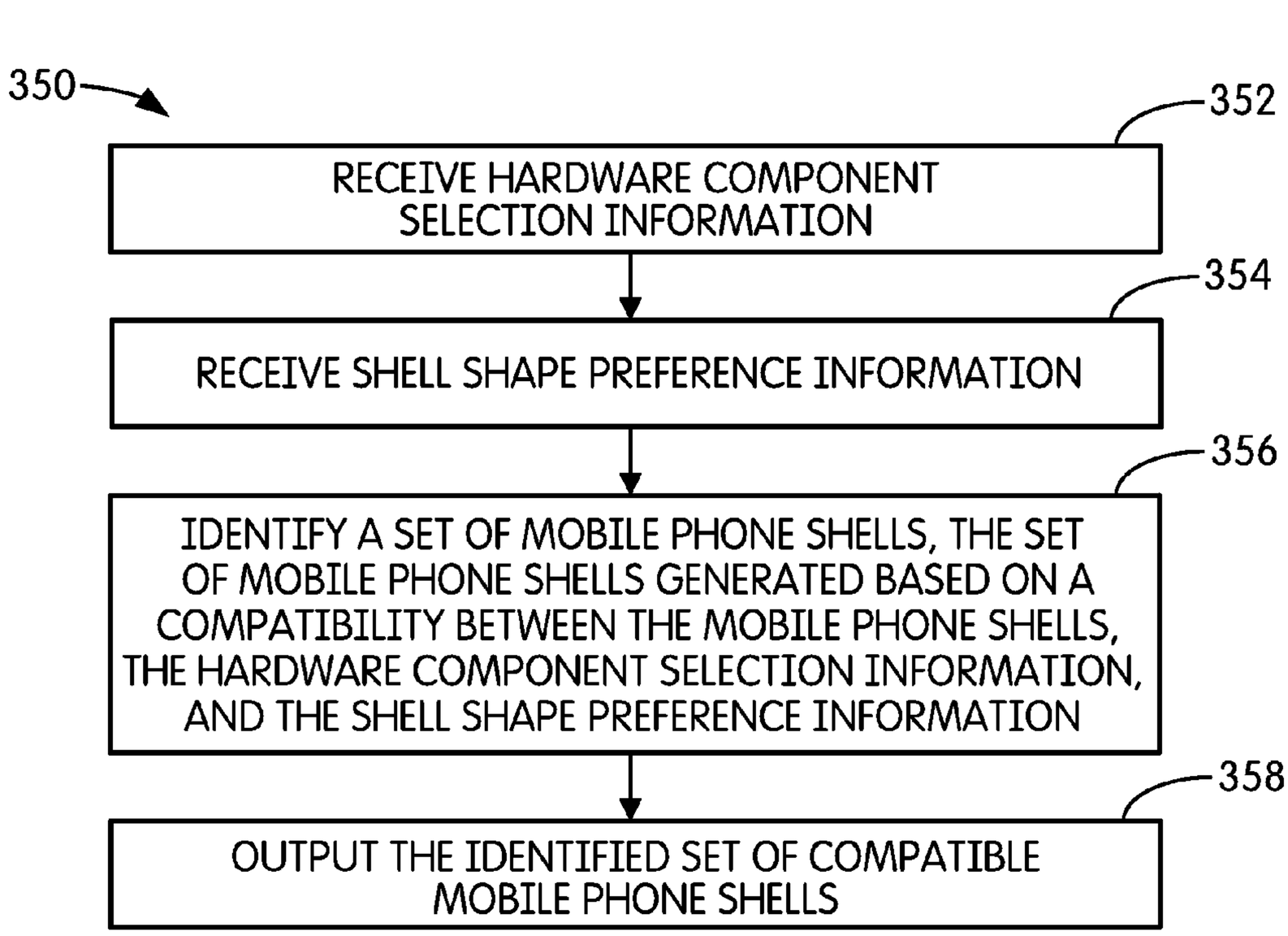
350
352
RECEIVE HARDWARE COMPONENT SELECTION INFORMATION
354
RECEIVE SHELL SHAPE PREFERENCE INFORMATION
356
IDENTIFY A SET OF MOBILE PHONE SHELLS, THE SET OF MOBILE PHONE SHELLS GENERATED BASED ON A COMPATIBILITY BETWEEN THE MOBILE PHONE SHELLS, THE HARDWARE COMPONENT SELECTION INFORMATION, AND THE SHELL SHAPE PREFERENCE INFORMATION
358
OUTPUT THE IDENTIFIED SET OF COMPATIBLE MOBILE PHONE SHELLS

FIG. 16

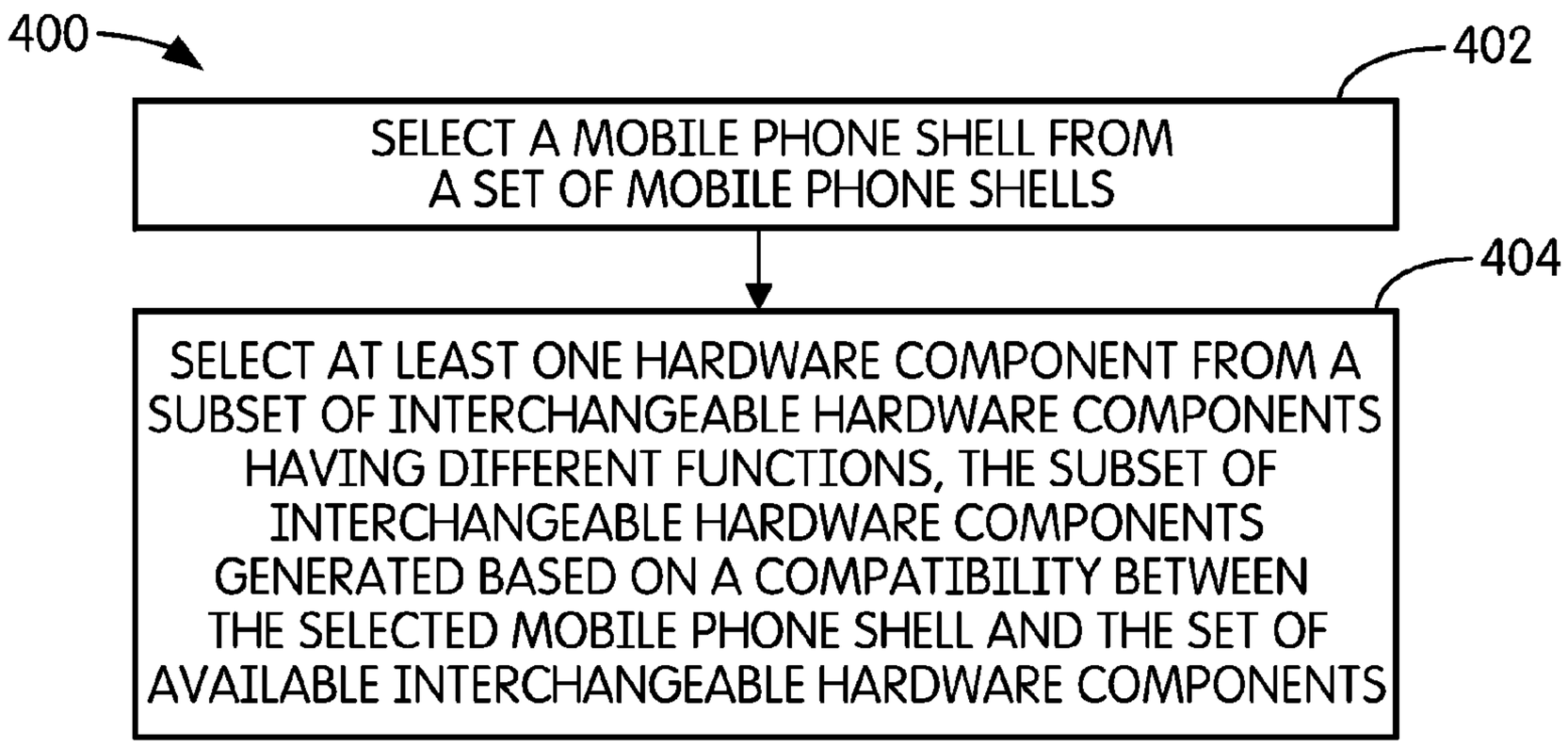
400
402
SELECT A MOBILE PHONE SHELL FROM A SET OF MOBILE PHONE SHELLS
404
SELECT AT LEAST ONE HARDWARE COMPONENT FROM A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS, THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS

FIG. 17

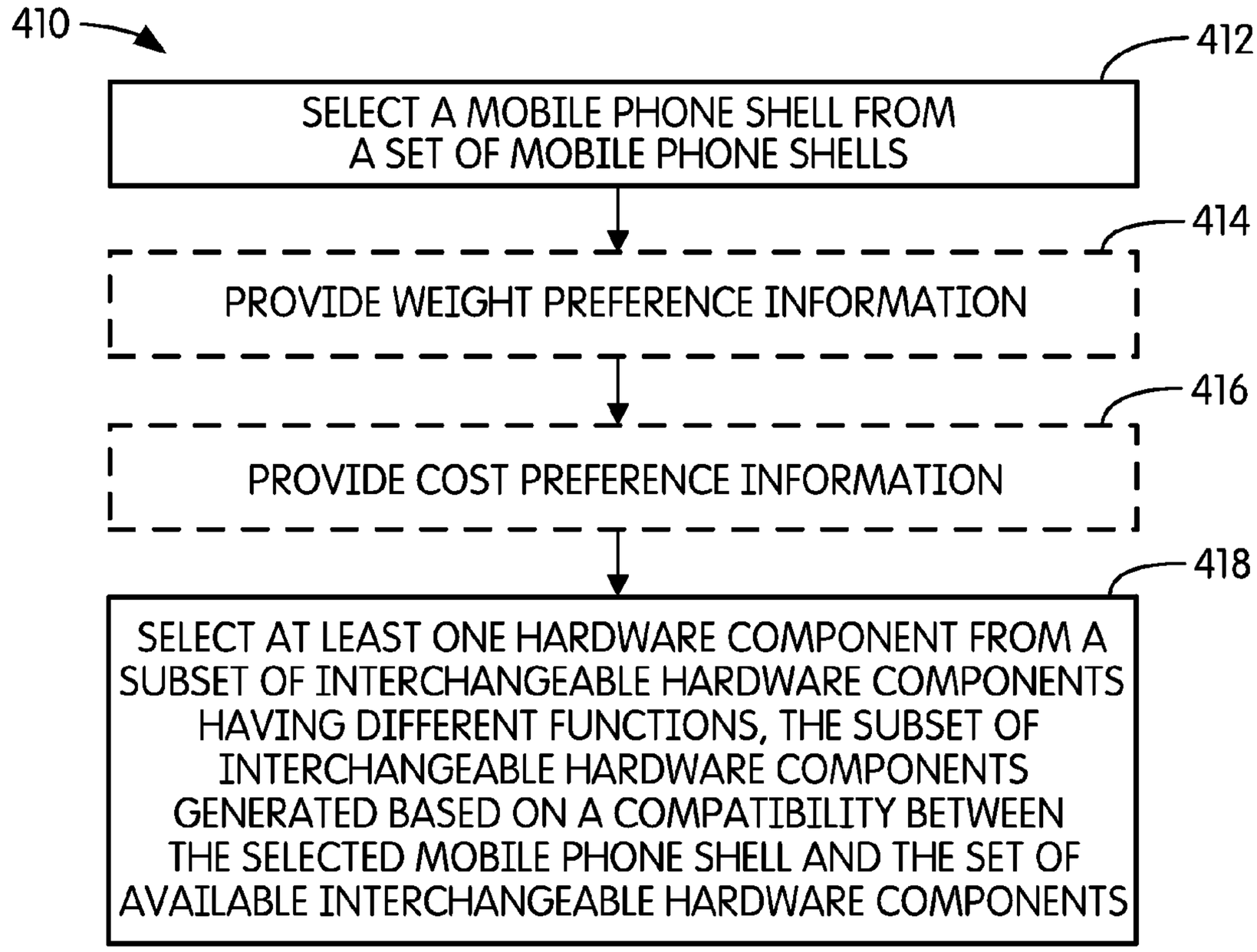
410
412
SELECT A MOBILE PHONE SHELL FROM A SET OF MOBILE PHONE SHELLS
414
PROVIDE WEIGHT PREFERENCE INFORMATION
416
PROVIDE COST PREFERENCE INFORMATION
418
SELECT AT LEAST ONE HARDWARE COMPONENT FROM A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS, THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS

FIG. 18

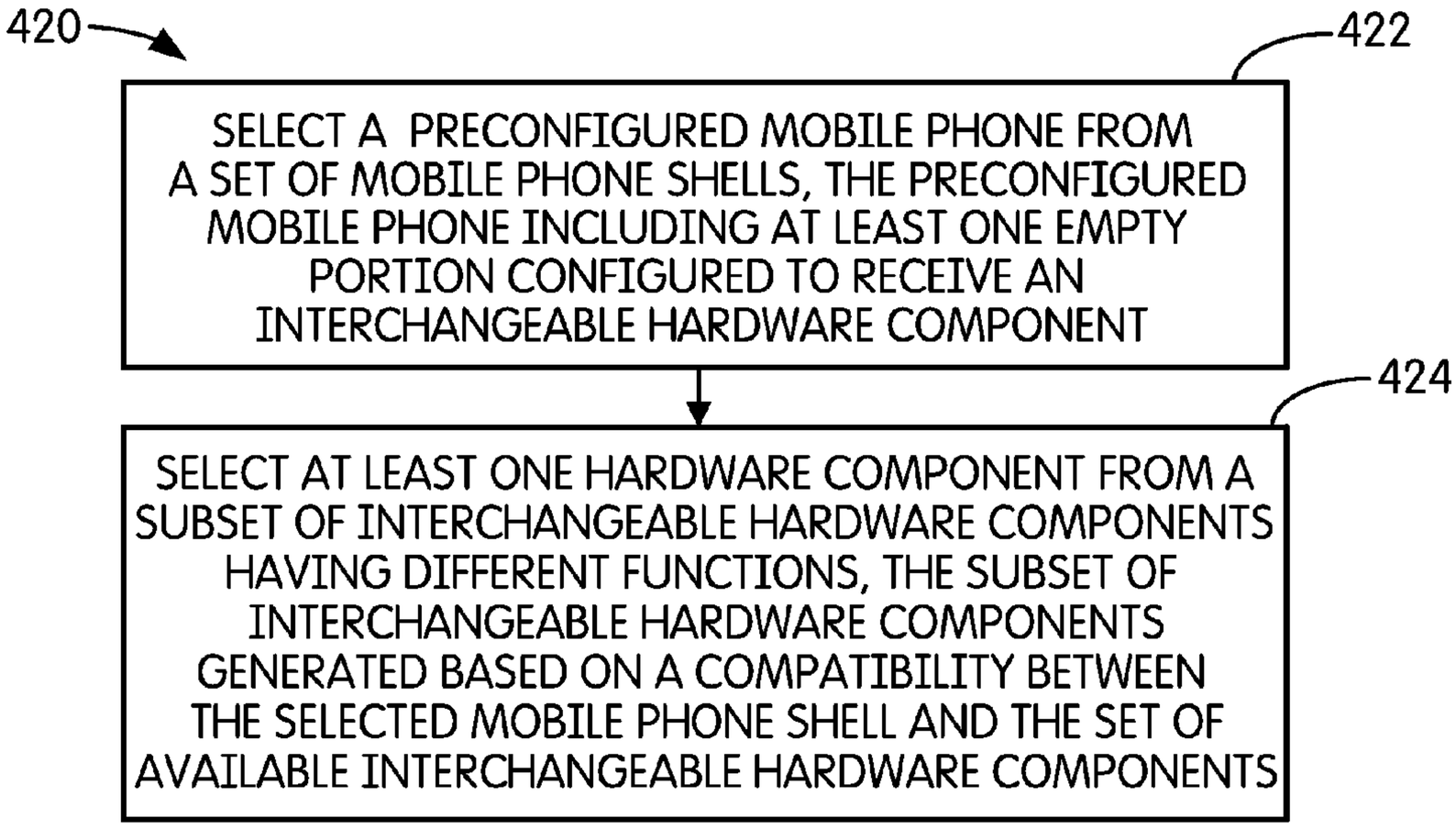
420
422
SELECT A PRECONFIGURED MOBILE PHONE FROM A SET OF MOBILE PHONE SHELLS, THE PRECONFIGURED MOBILE PHONE INCLUDING AT LEAST ONE EMPTY PORTION CONFIGURED TO RECEIVE AN INTERCHANGEABLE HARDWARE COMPONENT
424
SELECT AT LEAST ONE HARDWARE COMPONENT FROM A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS, THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS

FIG. 19

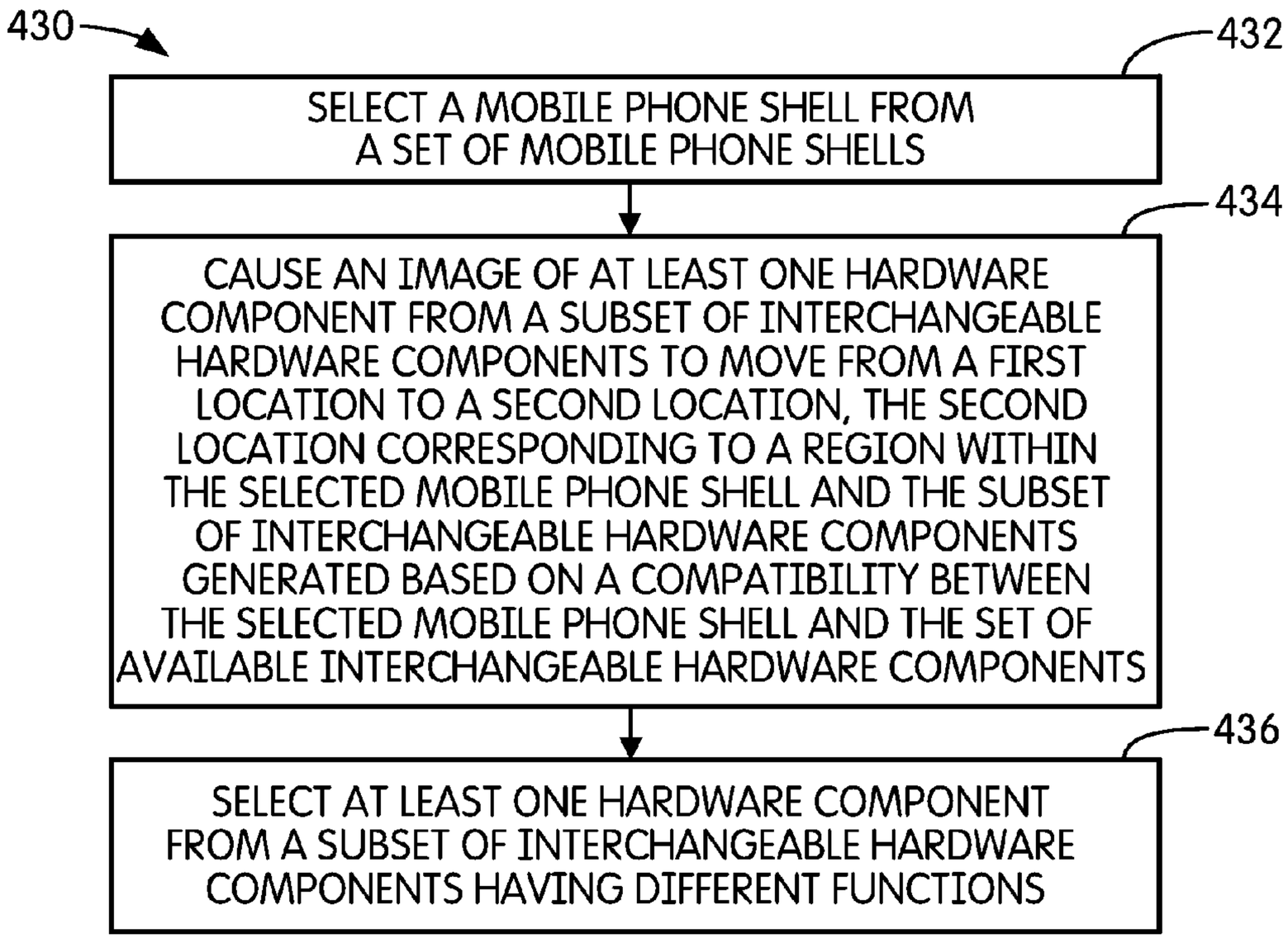
430
432
SELECT A MOBILE PHONE SHELL FROM A SET OF MOBILE PHONE SHELLS
434
CAUSE AN IMAGE OF AT LEAST ONE HARDWARE COMPONENT FROM A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS TO MOVE FROM A FIRST LOCATION TO A SECOND LOCATION, THE SECOND LOCATION CORRESPONDING TO A REGION WITHIN THE SELECTED MOBILE PHONE SHELL AND THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS
436
SELECT AT LEAST ONE HARDWARE COMPONENT FROM A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS

FIG. 20

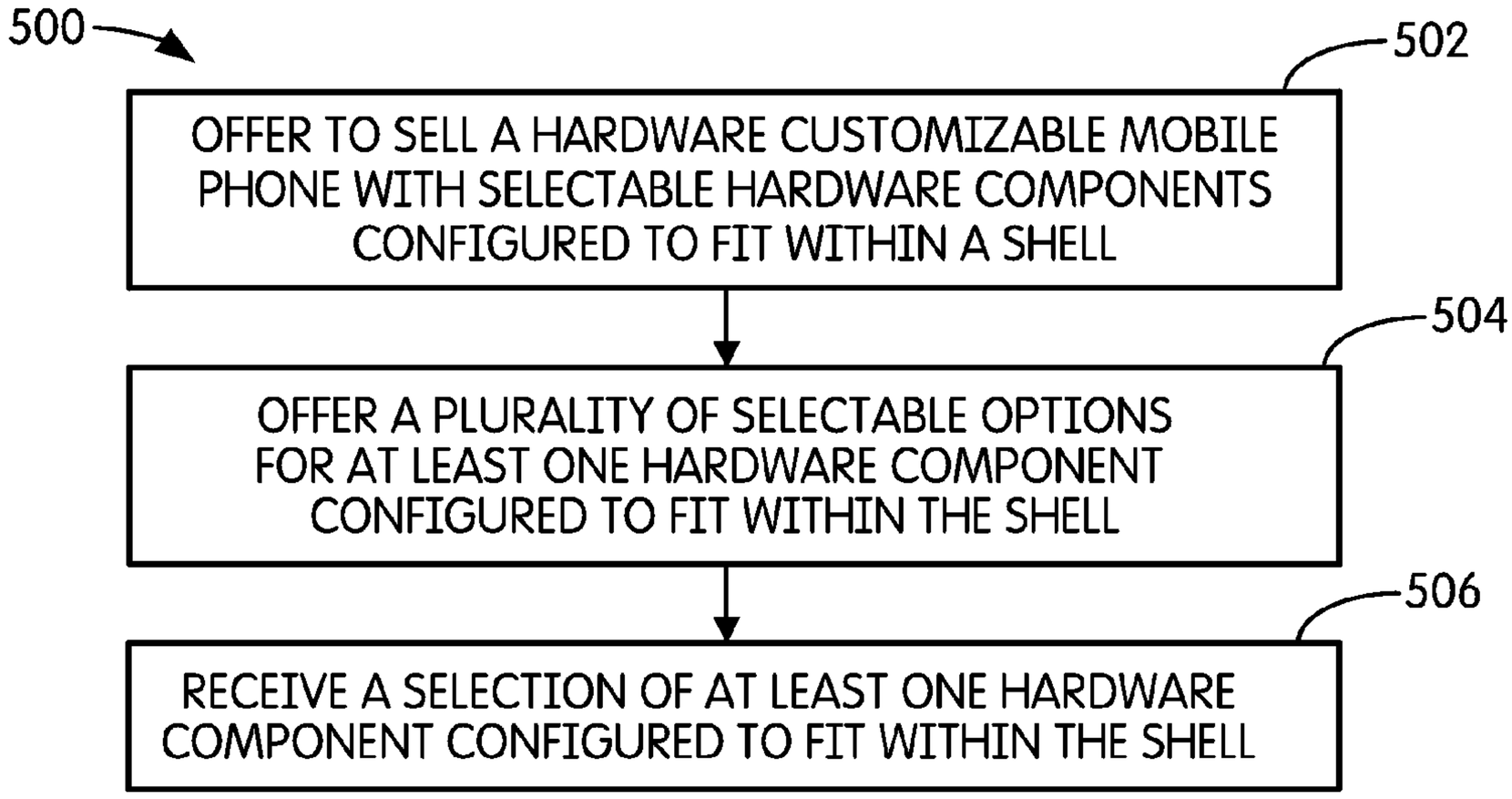
500
502
OFFER TO SELL A HARDWARE CUSTOMIZABLE MOBILE PHONE WITH SELECTABLE HARDWARE COMPONENTS CONFIGURED TO FIT WITHIN A SHELL
504
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL
506
RECEIVE A SELECTION OF AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL

FIG. 21

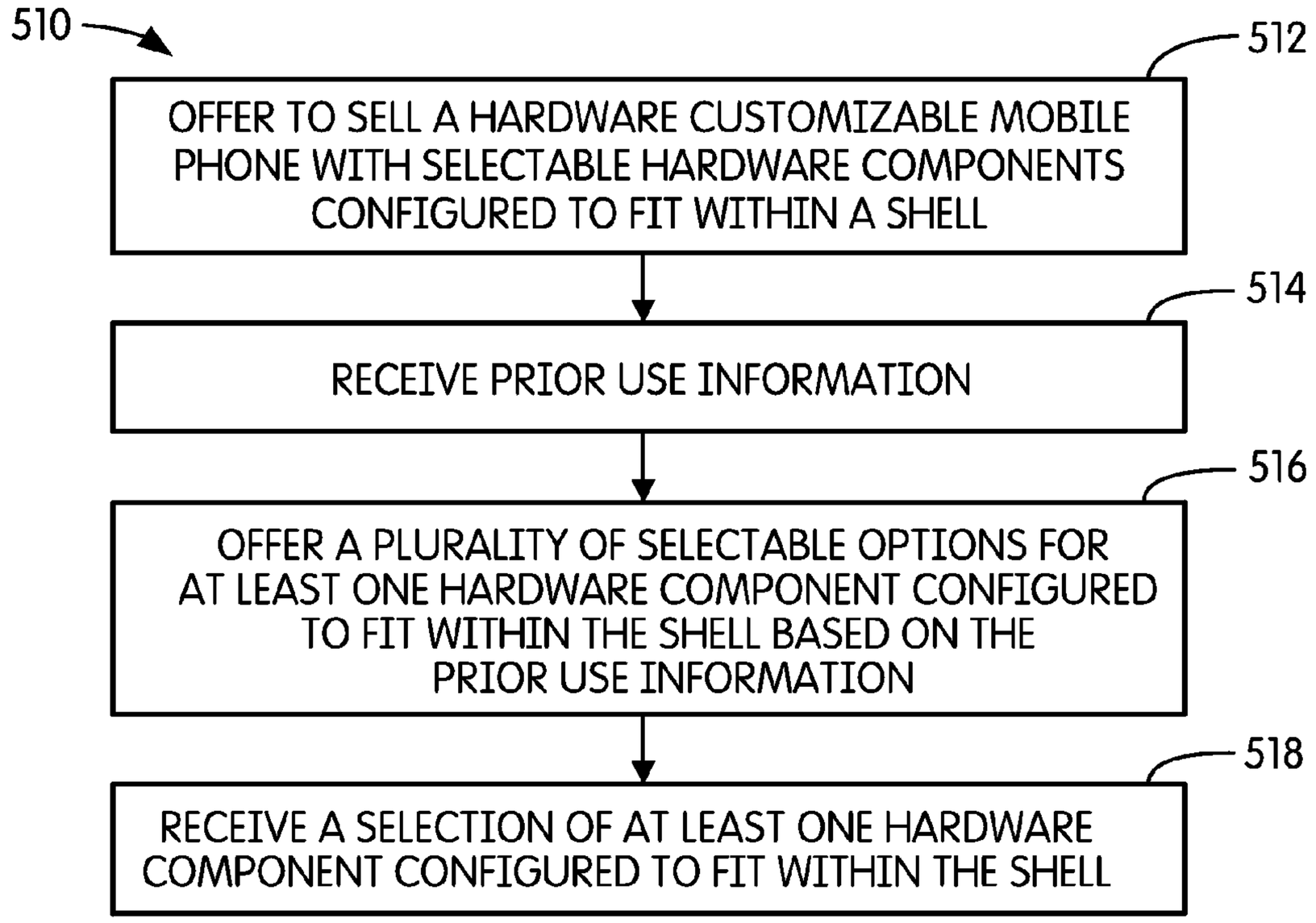
510
512
OFFER TO SELL A HARDWARE CUSTOMIZABLE MOBILE PHONE WITH SELECTABLE HARDWARE COMPONENTS CONFIGURED TO FIT WITHIN A SHELL
514
RECEIVE PRIOR USE INFORMATION
516
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL BASED ON THE PRIOR USE INFORMATION
518
RECEIVE A SELECTION OF AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL

FIG. 22

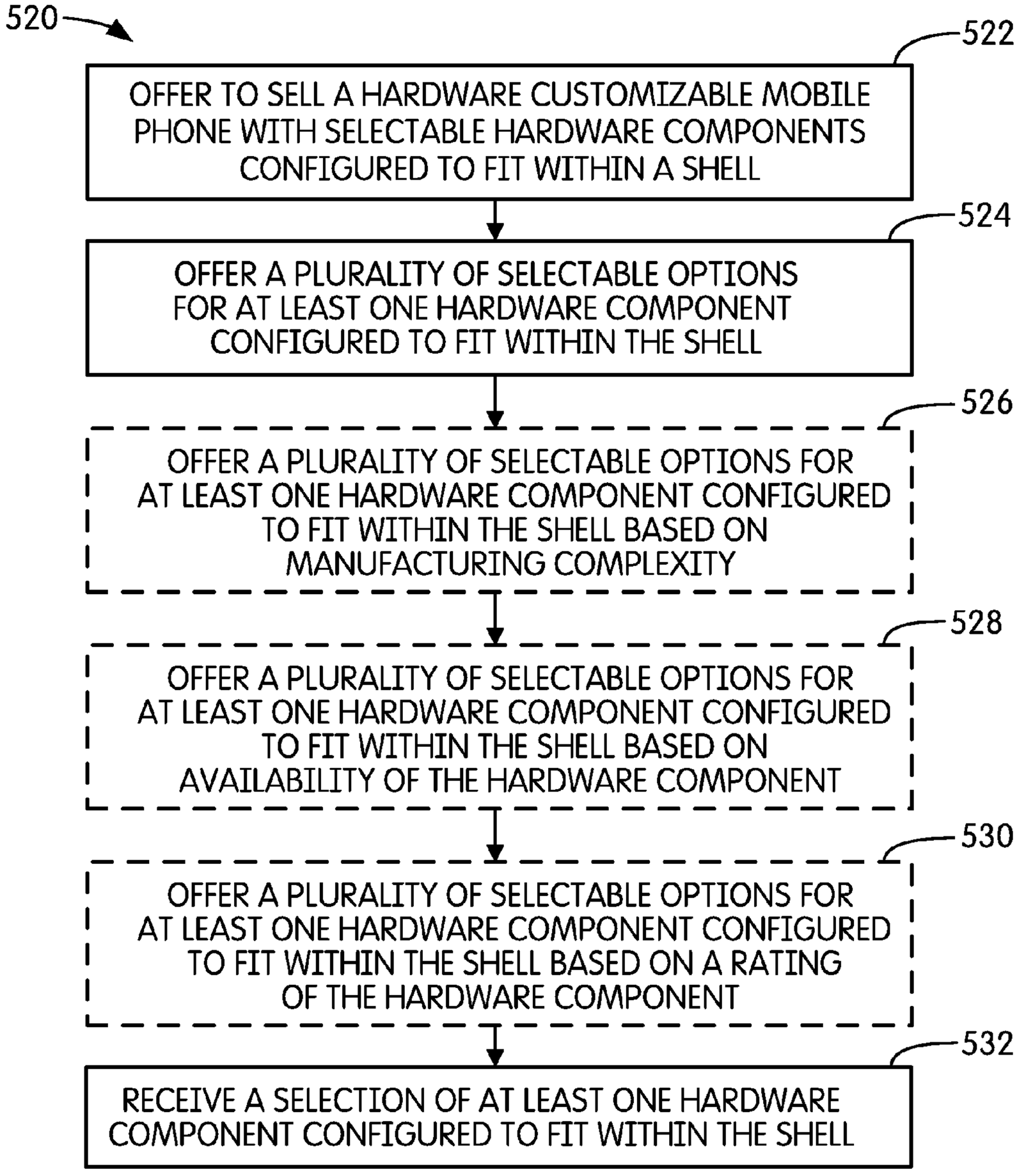
520
522
OFFER TO SELL A HARDWARE CUSTOMIZABLE MOBILE PHONE WITH SELECTABLE HARDWARE COMPONENTS CONFIGURED TO FIT WITHIN A SHELL
524
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL
526
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL BASED ON MANUFACTURING COMPLEXITY
528
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL BASED ON AVAILABILITY OF THE HARDWARE COMPONENT
530
OFFER A PLURALITY OF SELECTABLE OPTIONS FOR AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL BASED ON A RATING OF THE HARDWARE COMPONENT
532
RECEIVE A SELECTION OF AT LEAST ONE HARDWARE COMPONENT CONFIGURED TO FIT WITHIN THE SHELL

FIG. 23

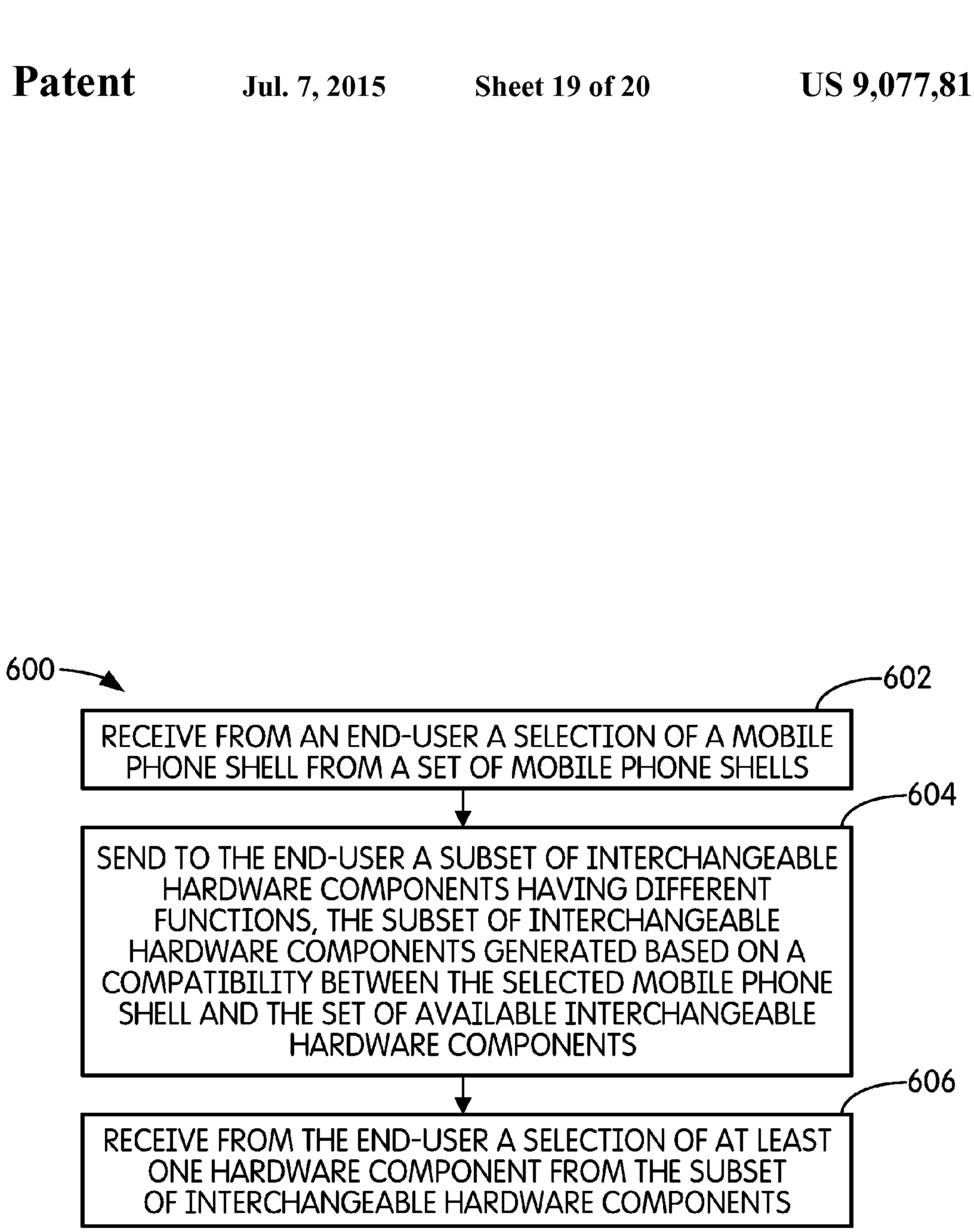
600
602
RECEIVE FROM AN END-USER A SELECTION OF A MOBILE PHONE SHELL FROM A SET OF MOBILE PHONE SHELLS
604
SEND TO THE END-USER A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS, THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS
606
RECEIVE FROM THE END-USER A SELECTION OF AT LEAST ONE HARDWARE COMPONENT FROM THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS

FIG. 24

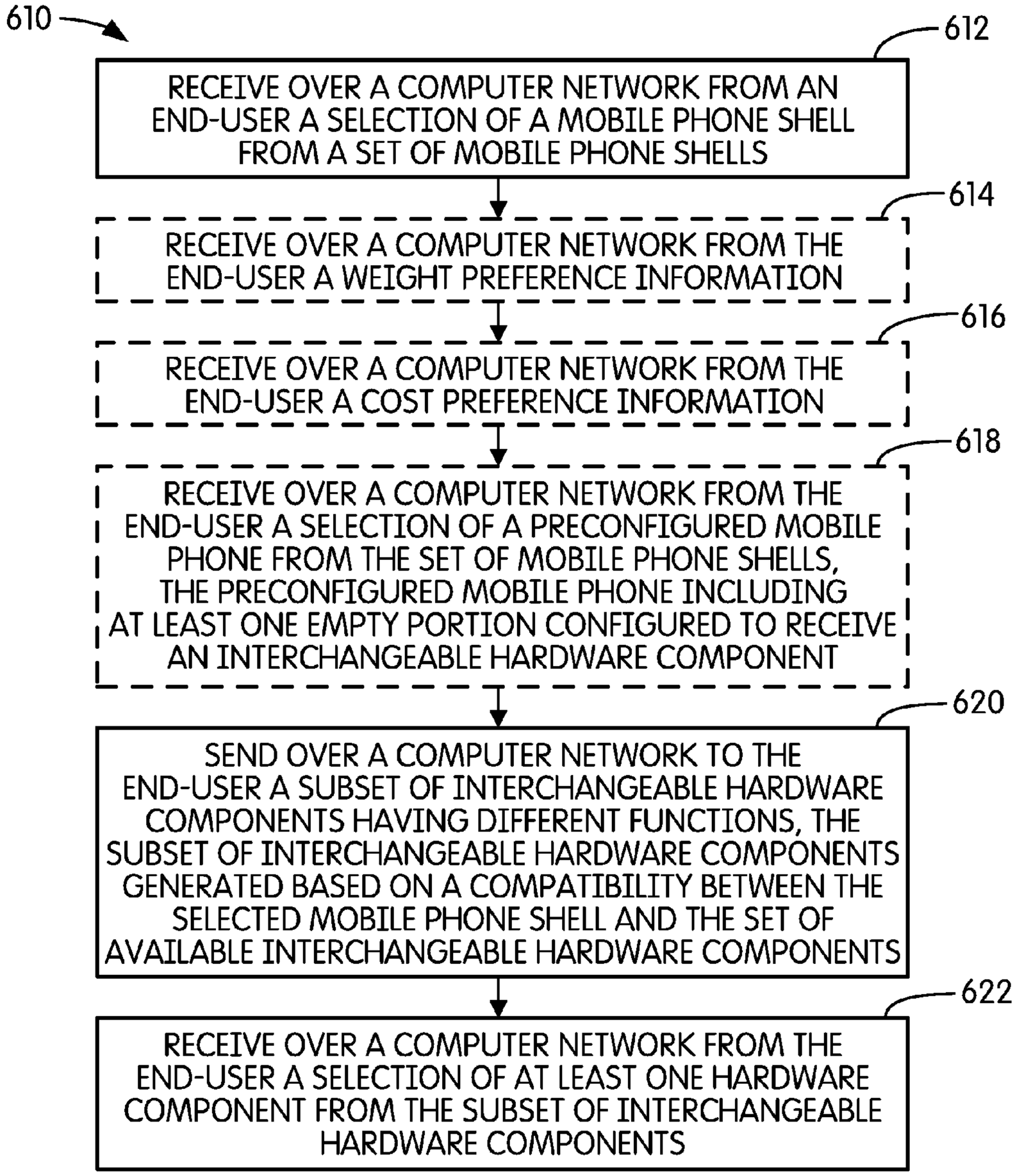
610
612
RECEIVE OVER A COMPUTER NETWORK FROM AN END-USER A SELECTION OF A MOBILE PHONE SHELL FROM A SET OF MOBILE PHONE SHELLS
614
RECEIVE OVER A COMPUTER NETWORK FROM THE END-USER A WEIGHT PREFERENCE INFORMATION
616
RECEIVE OVER A COMPUTER NETWORK FROM THE END-USER A COST PREFERENCE INFORMATION
618
RECEIVE OVER A COMPUTER NETWORK FROM THE END-USER A SELECTION OF A PRECONFIGURED MOBILE PHONE FROM THE SET OF MOBILE PHONE SHELLS, THE PRECONFIGURED MOBILE PHONE INCLUDING AT LEAST ONE EMPTY PORTION CONFIGURED TO RECEIVE AN INTERCHANGEABLE HARDWARE COMPONENT
620
SEND OVER A COMPUTER NETWORK TO THE END-USER A SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS HAVING DIFFERENT FUNCTIONS, THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS GENERATED BASED ON A COMPATIBILITY BETWEEN THE SELECTED MOBILE PHONE SHELL AND THE SET OF AVAILABLE INTERCHANGEABLE HARDWARE COMPONENTS
622
RECEIVE OVER A COMPUTER NETWORK FROM THE END-USER A SELECTION OF AT LEAST ONE HARDWARE COMPONENT FROM THE SUBSET OF INTERCHANGEABLE HARDWARE COMPONENTS

FIG. 25

CUSTOMIZED HARDWARE SELECTION FOR A MOBILE PHONE

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This application is a divisional of U.S. application Ser. No. 13/340,463, titled "Customized Hardware Selection for a Mobile Phone," filed Dec. 29, 2011, which is incorporated herein by reference in its entirety.

PRIORITY APPLICATIONS

The present application constitutes a continuation of U.S. patent application Ser. No. 13/765,505, entitled CUSTOMIZED HARDWARE SELECTION FOR A MOBILE PHONE, naming Alistair K. Chan, Philip A. Eckhoff, Roderick A. Hyde, Jordin T. Kare, David B. Tuckerman, Lowell L. Wood, Jr. as inventors, filed Feb. 12, 2013, which is currently co-pending or is an application of which a currently co-pending application is entitled to the benefit of the filing date, and which is a division of U.S. patent application Ser. No. 13/340,463, U.S. Pat. No. 8,391,934 entitled CMeeting (Questions/Emails)USTOMIZED HARDWARE SELECTION FOR A MOBILE PHONE, naming Alistair K. Chan, Philip A. Eckhoff, Roderick A. Hyde, Jordin T. Kare, David B. Tuckerman, Lowell L. Wood, Jr. as inventors, filed Dec. 29, 2011.

BACKGROUND

The present disclosure relates generally to the field of mobile phones. More specifically, the present disclosure relates to the field of hardware customizable mobile phones.

Mobile phones are notoriously cramped for space, making it difficult to include new widgetry with limited, rather than universal, appeal. Traditionally, as the volume required for essential hardware has decreased, mobile phones have also gotten smaller. Some new widgets have been incorporated into at least some of the freed up space, but to maintain economies of scale, mobile phones and the accompanying widgets are generally not customizable. Users may select a desired phone with preselected widgets, but only from a limited selection offered by the mobile phone maker or its competitors. Thus, there is a need for a hardware customizable mobile phone with user selectable components.

SUMMARY

One embodiment relates to a mobile phone. The mobile phone includes a shell and a hardware component coupled to the shell, wherein the hardware component is selected from a set of interchangeable components having substantially the same size but different functions.

Another embodiment relates to a computerized method of customizing hardware for a mobile phone. The method includes receiving shell selection information from a user input device, identifying a set of hardware components, the set of hardware components generated based on a compatibility between the hardware components and the shell selection information, and outputting the identified set of compatible hardware components.

Another embodiment relates to a computerized method of customizing hardware for a mobile phone. The method includes receiving a hardware component selection information from a user input device, identifying a set of compatible mobile phone shells, the set of mobile phone shells generated based on a compatibility between the mobile phone shells and the hardware component selection information, and outputting the identified set of compatible mobile phone shells.

Another embodiment relates to a method of customizing hardware by an end user for a mobile phone. The method includes receiving from an end-user a selection of a mobile phone shell from a set of mobile phone shells, sending to the end-user a subset of interchangeable hardware components having different functions, and receiving from the end-user a selection of at least one hardware component from the subset of interchangeable hardware components. The subset of interchangeable hardware components is generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components.

Another embodiment relates to a method of selling a mobile phone. The method includes offering to sell a hardware customizable mobile phone with one or more selectable hardware components configured to fit within a shell, offering a plurality of selectable options for at least one hardware component configured to fit within the shell, and receiving a selection of at least one hardware component configured to fit within the shell.

Another embodiment relates to a method of customizing hardware for a mobile phone. The method includes selecting a mobile phone shell from a set of mobile phone shells, and selecting at least one hardware component from a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components.

The foregoing is a summary and thus by necessity contains simplifications, generalizations and omissions of detail. Consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices and processes described herein, as defined solely by the claims, will become apparent in the detailed description set forth herein and taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exemplary display showing a variety of mobile phones, shown according to various exemplary embodiments.

FIGS. **2**A-**2**C are schematic block diagrams of mobile phones, shown according to exemplary embodiments.

FIG. **3** is a schematic block diagram of a mobile phone, shown according to another embodiment.

FIGS. **4**A-**4**D are detailed schematic block diagrams of cross-sectional side-elevation views of mobile phones, shown according to an exemplary embodiment.

FIG. **5** is an exemplary display showing a list of mobile phone shells, shown according to an exemplary embodiment.

FIG. **6** is an exemplary display showing a list of hardware components, shown according to an exemplary embodiment.

FIG. **7** is an exemplary display showing images of a mobile phone shell and hardware components, shown according to an exemplary embodiment.

FIG. **8** is a schematic diagram of a server and a client, connected over a network and configured for using the systems and methods of this disclosure, shown according to an exemplary embodiment.

FIG. **9** is a detailed block diagram of processing electronics, shown according to an exemplary embodiment.

FIG. **10** is a flowchart of a process for customizing hardware for a mobile phone, shown according to an exemplary embodiment.

FIG. **11** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **12** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **13** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **14** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **15** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **16** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **17** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **18** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **19** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **20** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **21** is a flowchart of a process for selling a mobile phone, shown according to an exemplary embodiment.

FIG. **22** is a flowchart of a process for selling a mobile phone, shown according to another embodiment.

FIG. **23** is a flowchart of a process for selling a mobile phone, shown according to another embodiment.

FIG. **24** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

FIG. **25** is a flowchart of a process for customizing hardware for a mobile phone, shown according to another embodiment.

DETAILED DESCRIPTION

Referring generally to the figures, systems and methods for a hardware customizable mobile phone and components thereof are shown according to various exemplary embodiments. A hardware customizable mobile phone generally includes a shell and one or more selectable hardware components coupled to the shell, either directly or indirectly (e.g., via a circuit board). For example, the selectable hardware component may plug into a receiver located in the phone. The selectable hardware components may come from a set of components having substantially the same size, but different functions. The selectable hardware components may be interchangeable with other hardware components from the same set or from a second set of components. The second set of components may have the same or different function and a different size, yet still be compatible with the receiver and the size of the shell. Methods of customizing a mobile phone are also described. According to one embodiment, a user may select a shell from a set of available mobile phone shells or select a hardware component from a set of available hardware components. The user is then provided with a subset of mobile phone shells or a subset of hardware components that are compatible with the selected shell or component. Compatibility may be based on a size value (e.g., length, width, thickness, area, volume, etc.), shape of the hardware component, power consumption, or receiver availability of the shell or other components. The user may then continue to select a shell or additional hardware components to further customize the mobile phone.

It should further be noted that for purposes of this disclosure, the term coupled means the joining of two members directly or indirectly to one another. Such joining may be stationary in nature or moveable in nature and such joining may allow for the flow of fluids, electricity, electrical signals, or other types of signals or communication between the two members. Such joining may be achieved with the two members or the two members and any additional intermediate members being integrally formed as a single unitary body with one another or with the two members or the two members and any additional intermediate members being attached to one another. Such joining may be permanent in nature or alternatively may be removable or releasable in nature.

Referring to FIG. **1**, a display **114** shows a variety of mobile phones **10**, according to various exemplary embodiments. Mobile phones **10** come in varying shapes (e.g., style, external appearance, curvilinearity, etc.) and sizes (e.g., height, width, length, area, volume, etc.). Mobile phones **10** generally include a shell **12**, a display **14**, and a user input device **16** (keypad, keyboard, button, trackball, touchscreen, end-user input device, etc.). A shell **12** is a generally rigid structure or housing configured to be grasped by a user and to protect the internal components of the mobile phone **10** from liquids, debris, impact or other contaminants. The shell **12** may include a removable cover configured to provide access to internal components such as a battery, SIM card, etc. A touchscreen style of mobile phone, shown as mobile phone **10***a*, includes a shell **12***a*, a touch-sensitive display **14***a*, one or more bezel or soft buttons **16***a*. A classic (e.g., candybar) style of mobile phone, shown as mobile phone **10***b*, includes a shell **12***b*, a display **14***b*, and a keypad **16***b*. A clamshell (e.g., flip-phone) style of mobile phone, shown as mobile phone **10***c*, includes a shell **12***c* having an upper portion **17***c* and a lower portion **18***c* hingedly coupled by a joint **19**. The clamshell mobile phone **10***c* includes a display **14***c* located on upper portion **17***c*, and a keypad **16***c* located on lower portion **18***c*. A slideout (e.g., slider) style of mobile phone, shown as mobile phone **10***d*, includes a shell **12***d* having an upper portion **17***d* and a lower portion **18***d*, which are slidably coupled. The slideout mobile phone **10***d* includes a display **14***d*, which may be touch-sensitive, located on upper portion **17***d*, and a keypad **16***d* (e.g., a numerical keypad, an alphanumeric keyboard, etc.) located on lower portion **18***d*.

Referring to FIGS. **2**A-**2**C, schematic block diagrams of a mobile phone **10**, shown as the touchscreen style mobile phone, are shown, according to exemplary embodiments. The mobile phone **10** is shown to include a shell **12**, an antenna **20**, and a processing electronics **104**. The antenna **20** may be configured for communication with a cellular network, and the antenna **20** and the processing electronics **104** may be coupled to the shell **12**, either directly or indirectly (e.g., via a circuit board, etc.). According to an exemplary embodiment, some hardware components are non-interchangeable. For example, the display **14**, keyboard **18**, processing electronics **104** (e.g., processor, etc.), antenna **20**, and a camera may be may be permanently fixed to the shell or coupled to the shell **12** in a manner that is not intended for interchangeability or in a manner that makes interchanging hardware compo-

nents prohibitively difficult. For example, the display **14** may be coupled to the shell **12** with the use of an adhesive (e.g., a room temperature vulcanization adhesive).

Briefly referring to FIG. **9**, a detailed block diagram of the processing electronics **104** of FIG. **2**A is shown, according to an exemplary embodiment. Processing electronics **104** includes a memory **120** and processor **122**. Processor **122** may be or include one or more microprocessors, an application specific integrated circuit (ASIC), a circuit containing one or more processing components, a group of distributed processing components, circuitry for supporting a microprocessor, or other hardware configured for processing. According to an exemplary embodiment, processor **122** is configured to execute computer code stored in memory **120** to complete and facilitate the activities described herein. Memory **120** can be any volatile or non-volatile memory device capable of storing data or computer code relating to the activities described herein. For example, memory **120** is shown to include modules **128-130** which are computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by processor **122**. When executed by processor **122**, processing electronics **104** is configured to complete the activities described herein. Processing electronics includes hardware circuitry for supporting the execution of the computer code of modules **128-130**. For example, processing electronics **104** includes hardware interfaces (e.g., output **150**) for communicating control signals (e.g., analog, digital) from processing electronics **104** to one or more circuits coupled to processing electronics **104**. Processing electronics **104** may also include an input **155** for receiving data or signals from other systems or devices.

Memory **120** is shown to include a memory buffer for receiving and storing data, for example user input, downloaded data, etc., until it is accessed by another module or process. Memory **120** is further shown to include a communication module **128**, which may include logic for communicating between systems and devices. For example, the communication module **128** may be configured to use an antenna or data port for communication over a network. The communication module **128** may further be configured to communicate with other components within the mobile phone over a parallel bus, serial bus, or network. Memory **120** is further shown to include a user interface module **130**, which includes logic for using user input data in memory buffer **124** or signals from input **155** to determine desired user responses. For example, the user interface module **130** may be configured to convert, transform, or process signals or data from a keyboard, mouse, or touchscreen into signals or data useable by processor **122**.

The shell **12** is further shown to include one or more receivers **22** (e.g., portion, region, socket, connector, etc.), shown as, a first receiver **22***a* and a second receiver **22***b*, which may be coupled directly or indirectly (e.g., via a circuit board, etc.) to the shell **12**. Each receiver **22** is configured to receive, support, or couple to a hardware component **24** (e.g., interchangeable hardware component, selectable hardware component, widget, element, etc.) of a certain size and configuration. As shown, the first receiver **22***a* is configured to receive a first hardware component **24***a* selected from a first set of components having substantially the same size but different functions. Hardware components **24** selected from the first set of hardware components may be interchangeable (e.g., swappable, substitutable, etc.) with other hardware components **24** in the first set of components. According to one embodiment, the interchangeable hardware components **24** of the first set have substantially the same shape.

The mobile phone **10** may include a second receiver **22***b*, which is configured to receive a second hardware component **24***b* selected from a second set of components having substantially the same size but different functions. The first receiver **22***a* and the second receiver **22***b* may be the same or different sizes. According to an exemplary embodiment, the first receiver **22***a* and the second receiver **22***b* have similar dimensions (e.g., length, width, area, volume, etc.), in which case a hardware component **24** may be installed in either the first receiver **22***a* or the second receiver **22***b*. It is not necessary that every receiver **22** have a hardware component **24** directly coupled (e.g., plugged in, inserted, installed, snapped in, connected, etc.) to it. For example, referring to FIG. **2**A, a first hardware component **24***a* is coupled to the first receiver **22***a*, but no hardware component is coupled to the second receiver **22***b*.

Referring to FIG. **2**C, it is further contemplated that a larger hardware component, shown as third hardware component **24***c*, may be disposed in both the first receiver **22***a* and the second receiver **22***b*. The third hardware component may be selected from a third set of components having substantially the same size but different function.

Each receiver **22** may include one or more electrical contacts **26** which are configured to electrically couple to the hardware component **24**. According to an exemplary embodiment, each of a set of hardware components **24** is configured to electrically couple to a set of electrical contacts **26**. Referring to FIGS. **2**A-**2**B, a hardware component **24** may be configured to couple only to the contacts **26** in one receiver **22**. Referring to FIG. **2**C, a hardware component **24** may be configured to couple to contacts **26** in more than one receiver **22**.

Referring generally to FIGS. **2-4**, the hardware component **24** may have compatible shapes and sizes. For example, a set of hardware components **24** may be the same size and, therefore, be exchangeable between receivers **22**. A set of hardware components **24** may be mutually interchangeable. For example, a third hardware component **24***c* may be the same size as the combination of a first hardware component **24***a* and a second hardware component **24***b*. As described above, a set of hardware components **24** may be include pre-specified electrical connections **28** to the mobile phone **10**. As shown, in FIG. **2**B, the number and arrangement of the contacts **26** in first receiver **22***a* and second receiver **22***b* enables the first and second hardware component **24***a*, **24***b* to be placed in either receiver. As shown, in FIG. **2**C, the number and arrangement of contracts **26** in the first and second receivers **22***a*, **22***b* enables the third hardware component **24***c* to be installed across both receivers **22**. Providing a standardized number and arrangement of contacts in the receivers **22** facilitates construction of hardware components that are compatible with the mobile phone **10**. It is further contemplated that a set of hardware components may include pre-specified optical connections to the mobile phone **10**, and that the hardware components **24** may include pre-specified electrical or optical connections to each other. For example, the third hardware component **24***c* may be configured to allow the first hardware component **24***a* to piggy-back thereon. Enabling piggy-backing facilitates the installation of larger or multi-receiver hardware components **24** without inherently requiring the removal of other hardware components. A set of hardware components **24** may have standard sizes or power consumptions to facilitate interchangeability. A set of hardware components may be configured to have a standard component dimensions (e.g., area, volume, etc.) or to fit within a standard shell volume.

The hardware components **24** may have a variety of functions. According to one embodiment, a hardware component **24** may be a connector, e.g., a Universal Serial Bus (USB) connector, an IEEE 1394 connector, a DisplayPort connector, a Digital Visual Interface connector, a coaxial cable connector, a High Definition Multimedia Interface connector, a registered jack, a TRS connector, or miniaturized versions thereof. In this embodiment, a user may insert a TRS connector hardware component into a first receiver **22***a* in order to output an analog signal, for example, to headphones. The user may then replace the TRS connector hardware components with a mini-USB connector hardware component in order to output a digital signal, for example, to a computer. According to an exemplary embodiment, the processing electronics **104** may include computer code (e.g., software, firmware, drivers, etc.) in the configuration data **126** of memory **120** to support communication between the processing electronics **104** and the hardware component. According to another embodiment, the hardware component **24** may include computer code (e.g., software, firmware, drivers, etc.) configured to support communication between the hardware component **24** and the processing electronics **104**.

According to various other embodiments, the hardware component **24** may include an ultrasonographic transducer, a heart monitor, a blood glucose tester, or an infrared camera. The hardware component **24** may include a micro impulse radar transducer, which may be configured to detect a heartbeat or the presence of an object or person on the other side of a wall or door. The hardware component **24** may include a food tester, for example, componentry configured to detect the presence of an allergen such as peanuts, fish, dairy, etc. The hardware component **24** may include a magnetic stripe reader, which may be used for the swiping or reading of data stored on a credit card. The hardware component **24** may include an RFID reader, which may be used for detecting and receiving information on a radio-frequency identification chip. The hardware component **24** may include an accident data recorder (e.g., flight recorder, black box, etc.), which may be configured for example to record location, velocity, acceleration information. The accident data recorder may include an accelerometer or gyroscope and may be configured to store peak information data or to stop overwriting data in response to a severe acceleration or deceleration. This may be useful, for example, for accident reconstruction purposes or for a parent monitoring the driving behavior of a teenage dependent. The hardware component **24** may include a power source (e.g., fuel cell, battery, solar cell, etc.). According to one embodiment, a small battery may couple a first receiver **22***a*, and larger battery (e.g., more powerful, longer life, etc.) may couple to first and second receivers **22***a*, **22***b*. The hardware component may include processing electronics (e.g., a microprocessor, memory etc.). For example, a user may insert a graphics processing unit into the mobile phone **10** to improve a gaming experience, or to support a video projector (which may be another hardware component **24**). The hardware component **24** may include a display. For example, a user may install a hardware component **24** containing additional volatile memory (e.g., RAM) or non-volatile memory (e.g., flash memory, etc.). According to another embodiment, the user may install a card reader hardware component (e.g., SIM card, SD card, etc.) into the mobile phone **10**. The hardware component **24** may include a speaker or a microphone to facilitate the playing or recording of audio signals. The hardware component **24** may include a keyboard, keypad, trackball, touchpad, or other user input device. The hardware component **24** may include a biometric identification reader (e.g., fingerprint reader, retinal scanner, etc.), which may be used to enhance security of the mobile phone **10**. The hardware component **24** may include an antenna (e.g., shortwave radio, amplitude modulation (AM), frequency modulation (FM), global system for mobile communication (GSM), code division multiple access (CDMA), 3G, 4G, global positioning system (GPS), echolocation (e.g., sonar), etc.), which may allow a user to receive or transmit signals. For example, a user having a 3G antenna, may elect to replace the antenna with a 4G antenna when the technology becomes available in their location, or a user may elect to replace a CDMA antenna with a GSM antenna when travelling in a GSM dominant country. For another example, a user may install an AM or FM antenna in order to listen to a radio broadcast.

According to a preferred embodiment, the hardware component **24** is disposed at least partially within the shell **10**. For example, it is contemplated that a transducer, connector, or camera may extend partially out of the shell **10** in order to emit, connect, or receive as necessary. According to other embodiments, the hardware component **24** is disposed completely within the shell **10**. In these embodiments, it may be necessary to open the shell **10** (e.g., remove a cover) in order to remove or swap a hardware component **24**.

According to various embodiments, the first hardware component **24***a*, the second hardware component **24***b*, the third hardware component **24***c*, or the interchangeable hardware components **24** generally may be selected by and end-user. An end-user may be a purchaser of the mobile phone **10** or an intended long-term possessor. According to other embodiments, the end-user may be an intermediary, for example, a person configuring the phone to resell (e.g., a retailer), lease, gift, (e.g., friend, family, etc.), or provide (e.g., coworker, employer, IT department, etc.) to another.

Referring to FIG. **3**, a schematic block diagram of a mobile phone **10**, shown as a clamshell style mobile phone **10***c*, is shown according to an exemplary embodiment. As shown, the size and shape of the mobile phone **10** may dictate that only one receiver **22** can fit within the shell **12**. Accordingly, the mobile phone **10** of FIG. **3** would not be able to accept the hardware component **24***c* of FIG. **2**C. Thus, a hardware component **24** for use in the mobile phone **10** may be selected from a subset of components that are compatible with the size and shape of the receiver of the mobile phone **10**.

Referring to FIGS. **4**A-**4**D, cross-sectional schematic block diagrams of a mobile phone **10**, shown generally as the a touchscreen style of mobile phone **10***a* of FIG. **1**, are shown according to exemplary embodiments. The mobile phone **10** of FIG. **4**A is shown to include a shell **12** having a relatively thin cross-section and to include a first receiver **22***a*. In contrast, the mobile phones **10** of FIGS. **4**B-**4**D are shown to include shells **12** having thicker cross-sections, which accommodate a second receiver **22***b* and a third receiver **22***c* below or behind the first hardware component **24***a*, the processing electronics **104**, and the antenna **20**. The mobile phone **10** of FIG. **4**B is shown to accommodate a longer hardware component **24***d* across (e.g., in, among, between, etc.) the second receiver **22***b* and third receiver **22***c*. The mobile phone **10** of FIG. **4**C is shown to accommodate a thicker hardware component **24***e* across (e.g., in, among, between, etc.) the first receiver **22***a* and the second receiver **22***b*. As shown, the third receiver **22***c* is configured to receive a different sized hardware component **24** than each of first and second receivers **22***a*, **22***b*. Accordingly the set of hardware components **24** configured to fit into the third receiver **22***c* are interchangeable with each other, but are not interchangeable with the set of hardware components **24** configured to fit into the first or second receivers **22***a*, **22***b*. The mobile phone **10** of FIG. **4**D is shown to accommodate a larger, more complex hardware

component **24***f* across (e.g., in, among, between, etc.) the first receiver **22***a*, the second receiver **22***b*, and the third receiver **22***c*. According to the embodiments shown, the thicker hardware components **24***e*, **24***f* of FIGS. **4**C and **4**D would not fit into the thin shell of FIG. **4**A. According to various other embodiments, the number and arrangement of receivers **22** and the shape and size of hardware components **24** create a vast number of possible combinations of hardware components **24** within a shell **12**, and, in effect, create a three-dimensional puzzle.

In contrast, conventional wisdom has been to constantly drive mobile phones to be smaller and smaller, thinner and thinner. These ever-shrinking phones leave no room for extra components, let alone interchangeable hardware components. However, with the customizable mobile phones disclosed herein, a user may select a larger (e.g., wider, longer, thicker, etc.) mobile phone in order to accommodate additional receivers or to accommodate a particularly desired selectable hardware component. Alternatively, a user may select a smaller phone knowing that he or she may swap out the interchangeable hardware components.

It should be noted that a particular style of mobile phone **10** does not inherently dictate its size or the number of receivers **22** within its shell **12**. For example, the clamshell style mobile phone **10***c* of FIG. **3** is shown to only include one receiver **22**; however, a user may select a longer, wider, or thicker clamshell phone **10***c* in order to accommodate additional receivers **22** or additional or larger selectable hardware components **24**.

According to one embodiment, the portion of the volume of the interchangeable hardware components **24** occupy a greater portion of the volume of the shell **12** than the non-interchangeable hardware components (e.g., display **14**, user input device **16**, processing electronics **104**, and antenna **20**. According to another embodiment, the interchangeable hardware components **24** occupy at least 50 percent of the volume of the shell **12**. According to another embodiment, the interchangeable hardware components **24** occupy at least 90 percent of the volume of the shell **12**.

Referring to FIGS. **1** and **5-8**, a system in which a user (e.g., an end-user) may customize a mobile phone is shown according to an exemplary embodiment. A client **110** is shown to communicate with a server **102** over a network **100** (e.g., local area network, wide area network, internet, etc.). The client **110** may include display **114**, processing electronics **104***c*, and a user input device **116**. The user input device **116** may be a keyboard, a keypad, a mouse, a trackball, a touchscreen, etc. The client **110** may be any suitable computing device, for example, a home computer, a portable computing device, a mobile phone, an in-store kiosk, etc.

As described above with respect to processing electronics **104**, and referring generally to FIG. **9**, processing electronics **104***c* may include a memory **120** and processor **122**. Processor **122** may be or include one or more microprocessors, an application specific integrated circuit (ASIC), a circuit containing one or more processing components, a group of distributed processing components, circuitry for supporting a microprocessor, or other hardware configured for processing. According to an exemplary embodiment, processor **122** is configured to execute computer code stored in memory **120** to complete and facilitate the activities described herein. Memory **120** can be any volatile or non-volatile memory device capable of storing data or computer code relating to the activities described herein. For example, memory **120** is shown to include modules **128-132** which are computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by processor **122**. When executed by processor **122**, processing electronics **104***c* are configured to complete the activities described herein. Processing electronics include hardware circuitry for supporting the execution of the computer code of modules **128-132**. For example, processing electronics **104***c* include hardware interfaces (e.g., output **150**) for communicating control signals (e.g., analog, digital) from processing electronics **104***c* to one or more circuits coupled to processing electronics **104***c*. Processing electronics **104***c* may also include an input **155** for receiving data or signals from other systems or devices. Memory **120** is shown to include a customization module **132** which may include logic for transforming data or signals from a user input module **130** or memory buffer **124** into information (e.g., selection information, preference information, etc.) which may be sent to the server **102**.

The server **102** is shown to include processing electronics **104***s*. As described above with respect to processing electronics **104** and **104***c*, and referring generally to FIG. **9**, the processing electronics **104***s* may include a memory **120** and processor **122**. Processor **122** may be or include one or more microprocessors, an application specific integrated circuit (ASIC), a circuit containing one or more processing components, a group of distributed processing components, circuitry for supporting a microprocessor, or other hardware configured for processing. According to an exemplary embodiment, processor **122** is configured to execute computer code stored in memory **120** to complete and facilitate the activities described herein. Memory **120** can be any volatile or non-volatile memory device capable of storing data or computer code relating to the activities described herein. For example, memory **120** is shown to include modules **128** and **134** which are computer code modules (e.g., executable code, object code, source code, script code, machine code, etc.) configured for execution by processor **122**. When executed by processor **122**, processing electronics **104***s* are configured to complete the activities described herein. Processing electronics include hardware circuitry for supporting the execution of the computer code of modules **128** and **134**. For example, processing electronics **104***s* includes hardware interfaces (e.g., output **150**) for communicating control signals (e.g., analog, digital) from processing electronics **104***s* to one or more circuits coupled to processing electronics **104***s*. Processing electronics **104***s* may also include an input **155** for receiving data or signals from other systems or devices. Memory **120** is shown to include a compatibility module **134** which may include logic for receiving selection or preference information from a client and providing a set of compatible shells or a set of compatible hardware components.

The user may first select a mobile phone shell **12** from a set of mobile phone shells **12**. Referring to FIG. **5**, the user may select from a list **51** of shells, for example, shown on a display **114**. The user may select from the list **51** by selecting or clicking on the text, checking a box, selecting a radio button, or any other suitable method of selection. Referring to FIG. **1**, the user may select from one or more images **53**, **55** of the mobile phone shells **12**, for example, shown on a display **114**. The list or images of the mobile phone shells **12** may be provided by and caused to be displayed by the server **102**. The set of shells **12** may include different styles, shapes, and sizes of mobile phone shells. The user may select a mobile phone shell **12** based on at least one of size, volume, and shape. The user may also provide or select a weight preference information (e.g., preferred weight of the mobile phone, a preferred weight range of the mobile phone, a priority of the weight of the mobile phone relative to other factors, etc.). The user may also provide or select a cost preference information (e.g., preferred cost or price of the mobile phone, a preferred cost or

price range of the mobile phone, a priority of the cost or price the mobile phone relative to other factors, etc.).

The user selection may be sent from the client **110** to the server **102** as shell selection information. If provided, the weight preference information and the cost preference information may also be sent from the client **110** to the server **102**. The server **102**, in turn, receives the shell selection information, weight preference information, and/or the cost preference information. The server **102** may generate or identify a subset of all available hardware components based on a compatibility between hardware components **24** and the shell corresponding to the shell selection information. According to another embodiment, the server **102** may receive the generated set of hardware components **24** from another computer.

The compatibility between the mobile phone shell **12** and the selectable or interchangeable hardware components **24** may be based on at least one size value (e.g., length, width, thickness, area, volume, shape, etc.). For example, the volume of the thicker hardware component **24***e* of FIG. **4**C would not fit within the thinner shell **12** of FIG. **4**A. Similarly, the complex hardware component **24***f* of FIG. **4**D would not fit within the shells **12** of FIG. **3** or **4**A. The compatibility may be based on at least one of the number and arrangement of receivers **22** and electrical contacts **26** available in the shell **12** that corresponds to the shell selection information. If received, compatibility may be based on the weight preference information and/or the cost preference information.

The server **102** may then provide a subset of hardware components **24** that are compatible with the selected mobile phone shell **12**. Referring to FIGS. **6** and **7**, the subset of compatible hardware components **24** may be provided as a list **61** or as an image **70**. The server may also provide an auxiliary information relating to the hardware components **24**. For example, the list **61** or image **70** may also include a size, a weight, a cost, a rating, and a backlog (i.e., time until delivery) of the hardware component. The subset of selectable hardware components **24** which are incompatible with the shell selection information (e.g., are not part of the subset of compatible hardware components **24** generated based on a compatibility between hardware components **24** and the selected shell **24**) may either not be provided or may be provided along with an indicia of incompatibility (e.g., strikethrough, grayed out, dashed outline, etc.). According to another embodiment, the subset of hardware components **24** may be stored to a memory for use in a non-graphical process, e.g., an order fulfillment system. For example, the output may be provided to an assembly facility as described further below.

The system may also provide an indication that the compatibility of a hardware component **24** with the shell selection information is dependent upon one or more criteria. For example, the server **102** may provide an indication that a second hardware component **24***b* may not also fit in the selected mobile phone shell due to the size of a first hardware component **24***a*. Referring briefly to FIG. **7**, the server **102** may provide an indication **78** that a power hungry hardware component (e.g., heart monitor hardware component **76**) requires a larger battery (e.g., XL battery hardware component **74**). The server **102** may provide an indication that two power hungry hardware components should not both be installed into the same mobile phone. The server **102** may provide an indication **79** that a hardware component **24** is incompatible with the selected shell **12** or may be compatible with a different shell **12**. For example, the server **102** may suggest that a popular hardware component **24** is compatible with a mobile phone shell **12** that is thicker or longer than the presently selected shell.

The provided subset of hardware components **24** may include individual hardware components **24** or combinations of hardware components compatible with the shell selection information. One combination may include related items, for example, a mini-USB connector, a mini-DisplayPort connector, and a mini-HDMI connector. Another combination may include a power hungry hardware component and a larger battery. Another combination may be profession specific; for example, a heart monitor hardware component and an ultrasonographic transducer hardware component. Another combination may include specifically packaged hardware components; for example, a larger battery being longer rather than thicker in order to fit in the selected shell with another hardware component. Yet another combination may include a speaker hardware component and a microphone hardware component.

The user may further customize the mobile phone **10** by selecting at least one compatible hardware component **24** from the set or subset of hardware components that are compatible with the selected shell **12**. Referring to FIG. **7**, a user may select the desired hardware component **24** by placing (e.g., moving, dragging, etc.) an image **80** of a hardware component **24** in an image **70** of the selected mobile phone shell **12**. For example, the user may drag the "RAM" hardware component **71** from its location on the right side of the display **114** to one of the available receiver **22***a-d* locations. The user may reconfigure the interchangeable hardware components **24** as desired. For example, a right-handed user may put a mini-USB connector hardware component **73** on the right side of the shell **12** in order to facilitate connection and disconnection of a USB cable or device. The user selection may be sent from the client **110** to the server **102** as a first hardware selection information, and the server **102**, in turn, may receive the first hardware selection information.

According to various other embodiments, the system may receive other types of information, for example, prior use information, rating information, manufacturing information, etc. Prior use information may include how often the battery was charged, the depth of the mean or median battery cycle, number of calls received, number of calls dropped, number of text messages sent, acceleration data, etc. The prior use information may be provided by a user, retrieved from the user's account information, or retrieved from the user's current phone. For example, the prior use information may be retrieved from a prior use recorder hardware component in the user's current mobile phone. The battery usage information may be used by the system to suggest an appropriately sized battery. The number of texts sent may be used to suggest a particular style of phone (e.g., a phone with a full keyboard) or texting plan. The acceleration (e.g., number of times the phone was dropped) may be used to suggest a more rugged shell, more rugged hardware components, a protective covering for the shell, or increased phone insurance. Rating information **63** may include ratings based on popularity, based on other users' opinions, or based on objective functionality testing. The manufacturing information may include manufacturing complexity (e.g., fitting two large hardware components tightly in a small shell) or availability of a hardware component (e.g., a backorder, or rarely purchased). The set of hardware components that are compatible with the selected shell and hardware may be updated in response to additional informations received.

The server **102** may then provide a set of second hardware components **24**, the set of second hardware component gen-

erated based on a compatibility between the second hardware component, the first hardware selection information, and shell selection information. For example, if a user selects a small, lightweight battery as a first hardware component **24**, the updated set of hardware components may not include power hungry hardware components. Similarly, if the first selected hardware component is a large component, other large components may be removed from the updated sets. The system may continue to update the sets of compatible hardware as the user selects and deselects hardware components and shell styles, shapes, and size.

According to one embodiment, a user may select a preconfigured mobile phone **10**. The preconfigured mobile phone **10** includes one or more hardware components **24** already in place in a receiver **22** and may include one or more empty receivers **22**. The set of preconfigured phones **10** may be provided to the user based on price, popularity, a desire to reduce inventory of particular components, cost, etc. According to one embodiment, a mobile phone **10** may be preconfigured by a designer to have a certain shell **12** (e.g., colors, logos, pattern, print, picture, texture, etc.) and hardware components **24**. According to another embodiment, the phone **10** may be preconfigured with combinations of hardware components **24**, as described above. A user may then select from a subset of interchangeable hardware components **24** which are compatible with the one or more empty receivers **22**.

According to another embodiment, the user may first select one or more hardware components **24**. The user may select from a list **61** of hardware components **24** or from one or more images **80** of hardware components **24**. The user may select the hardware components **24** individually or select a predefined combination of hardware components **24**. The user is then provided with a set of mobile phone shells **12** generated based on a compatibility between the mobile phone shells **12** and the selected hardware components **24**. The set of mobile phone shells **12** may be provided as a list **51** or as one or more images **53**, **55**. The compatibility may be based on at least one size value (e.g., length, area, thickness, volume, etc.), the number or orientation of receivers **22** or electrical contacts **26** within the shell, etc. The user may also provide or select cost preference information, weight preference information, or shell preference information (e.g., a shell style, shell shape, shell size, shell color, etc.). These preferences may be factored into determining the set of mobile phone shells **12** to be provided to the user.

The set of mobile phone shells **12** provided may be standard or custom shells. For example, after selecting certain "must have" hardware components **24** which do not fit in one of the available shells **12**, the user may be given the option of having a custom shell **12** made to fit the components.

As described above, the system may provide an indication of dependency between certain hardware components **24** and between certain hardware components **24** and shells **12**. The server **102** may also provide an indication that a particular hardware component **24** is causing an incompatibility with a shell **12**. For example, if the user picked one thick hardware component **24**, the system may provide an indication that that thick hardware component is preventing the selection of a thin mobile phone shell **12**. The server **102** may further provide a suggestion of alternative components which may have the same functionality, but solve the incompatibility. Further, suggestions may be based on optimizations of space, weight, cost, etc. Besides using an optimization approach, heuristic, rule-based, or other ad-hoc approaches may be used to generate suggestions. For example, a user may have selected an inexpensive but larger hardware component **24**, and the system may suggest the more expensive but smaller hardware component. The smaller hardware component **24** may then be compatible with thinner or otherwise smaller mobile phone shells **12**.

The system may be configured to update the sets or subsets of selectable hardware components **24** and shells **12** in substantially real time. For example, upon selecting a first hardware component **24**, the system may remove or indicate incompatibility of a subset of mobile phone shells **12**. Or upon deselecting a hardware component **24**, the system can cause other hardware components **24** and mobile phone shells **12** to be shown as compatible. According to one embodiment, selection of a hardware component **24** having a large volume may remove a mobile phone shell **12** having a small volume from possible selection. Thus a user may see how each hardware component **24** affects his or her options for mobile phone shells **12**. After selecting a shell **12**, the set of compatible hardware components **24** may be updated. For example, the system may provide a subset of hardware components **24** which are compatible with the previously selected hardware components **24** and the selected mobile phone shell **12**. The user may continue to select additional hardware components **24** to fill out the remaining receivers **22***a-d*. Compatibility subsets, indications of dependency, and suggestions, may be updated with each additional selection.

According to another embodiment, the client **110** of FIG. **8** may download mobile phone shell set data, hardware component set data, compatibility data, dependency data, and other necessary information for mobile phone customization from one or more servers **102**. For example, the compatibility module **134** on the server **102** may be configured to provide phone shell set data, hardware component set data, compatibility data, and dependency data to a client **110**. The customization module **132** on the client **110** may then receive information (e.g., selection information, preference information, etc.) from the user input device **116** or user interface module **130**. The customization module **132** may then generate sets of shells **12** and hardware components **24** based on compatibility and provide the sets to processor **122**, display **114**, output **150**, or another module. For example, the user may select a mobile phone shell **12** from a set of mobile phone shells **12**, and the customization module **132** generates a subset of interchangeable hardware components **24** having different functions, the subset of interchangeable hardware components **24** being generated based on the compatibility between the selected mobile phone shell **12** and the set of available interchangeable hardware components **24**.

Using the systems and methods described herein, one may offer to sell a hardware customizable mobile phone **110** with selectable hardware components **24** to fit within a shell **12**. The seller may offer one or more mobile phone shells **12**, and the seller may receive a selection of a mobile phone shell. The seller may offer a one or more selectable options for at least one hardware component **24** configured to fit within the mobile phone shell **12**, and the seller may receive a selection of at least one hardware component configured to fit within the shell.

According to one embodiment, a seller may provide a price discount on a mobile phone **10** in exchange for the buyer purchasing a mobile phone **10** with a certain hardware component **24**. According to another embodiment, a lessor may provide a discounted mobile phone **10** to a lessee if the mobile phone **10** contains an accident data recorder hardware component or a prior use information recorder hardware component. The accident data recorder or prior use information recorder hardware components may have a particular configuration (e.g., shape, electrical contacts, encryption key, lock, etc.) which corresponds to a particular receiver **22** in the

mobile phone **10**; thus making removing or replacing the recorder hardware component prohibitively difficult.

Further using the systems and methods described herein, an aftermarket customizer may sell interchangeable hardware components **24**. For example, if a user already has a customizable mobile phone **10**, the user may use a system to determine if another interchangeable hardware component **24** will fit in their mobile phone **10**. It is contemplated that some original equipment manufacturers will use hardware or software locks on the interchangeable hardware components **24** or the receivers **22** in the mobile phone shells **12** in order to inhibit the use of uncertified or counterfeit hardware components **24**.

The selected shell and hardware components may be provided to an assembler (e.g., assembly facility, manufacturer, manufacturing facility, etc.). The assembler may receive one or more styles, shapes, or sizes of mobile phone shells **12**. The assembler may also receive a plurality of interchangeable hardware components **24** which are configured to fit with the mobile phone shells **12**. Then the assembler may assemble one or more interchangeable hardware components **24** into a mobile phone shell **12** in response to an order. The hardware customizable mobile phone **10** may be assembled in response to a specific customization (e.g., by an end-user) or in response to a general order. For example, a retailer may order several of a particular configuration due to its popularity. Another retailer may order a particular configuration because a certain celebrity has that configuration.

Referring to FIG. **10**, a flowchart of a process **200** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **200** is shown to include the steps of receiving shell selection information from a user input device (step **202**), identifying a set of hardware components, the set of hardware components generated based on a compatibility between the hardware components and the shell selection information (step **204**), and outputting the set of identified compatible hardware components (step **206**). For example, according various embodiments, the step **202** of receiving the shell selection information includes receiving from a memory, a communication interface, or user input device; the step **204** of identifying the set of hardware components may be performed at processing electronics; and the step **206** of outputting the set of components includes outputting to a memory, display interface, or communication interface.

Referring to FIG. **11**, a flowchart of a process **210** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **210** is shown to include the steps of providing a set of mobile phone shells (step **212**), receiving shell selection information (step **214**), identifying a set of hardware components, the set of hardware components generated based on a compatibility between the hardware components and the shell selection information (step **220**), and outputting the set of identified compatible hardware components (step **222**). Process **210** may also include one or more of the steps of receiving weight preference information (step **216**) and receiving cost preference information (step **218**).

Referring to FIG. **12**, a flowchart of a process **230** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **230** is shown to include the steps of receiving shell selection information (step **232**), identifying a set of hardware components, the set of hardware components generated based on a compatibility between the hardware components and the shell selection information (step **234**), outputting the set of identified compatible hardware components (step **236**), receiving first hardware selection information (step **238**), identifying a set of compatible second hardware components, the set of second hardware components generated based on a compatibility between the second hardware components, the first hardware selection information, and the shell selection information (step **240**), and outputting the set of identified second compatible hardware components (step **242**). Process **230** may further include the step of providing an indication that the compatibility of a hardware component with the shell selection information is dependent upon one or more criteria (step **244**).

Referring to FIG. **13**, a flowchart of a process **300** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **300** is shown to include the steps of receiving hardware component selection information (step **302**), identifying a set of compatible mobile phone shells, the set of mobile phone shells generated based on a compatibility between the mobile phone shells and the hardware component selection information (step **304**), and outputting the identified set of compatible mobile phone shells (step **306**). For example, according various embodiments, the step **302** of receiving the hardware component selection information includes receiving from a memory, a communication interface, or user input device; the step **304** of identifying the set of mobile phone shells may be performed by processing electronics; and the step **306** of outputting the set of mobile phone shells includes outputting to a memory, display interface, or communication interface.

Referring to FIG. **14**, a flowchart of a process **310** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **310** is shown to include the steps of providing a set of hardware components (step **312**), receiving hardware component selection information (step **314**), identifying a set of compatible mobile phone shells, the set of mobile phone shells generated based on a compatibility between the mobile phone shells and the hardware component selection information (step **320**), and outputting the identified set of compatible mobile phone shells (step **322**). Process **310** may also include one or more of the steps of receiving weight preference information (step **316**) and receiving cost preference information (step **318**).

Referring to FIG. **15**, a flowchart of a process **330** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **330** is shown to include the steps of receiving hardware component selection information (step **332**), identifying a set of mobile phone shells, the set of mobile phone shells generated based on a compatibility between the mobile phone shells and the hardware component selection information (step **334**), outputting the identified set of compatible mobile phone shells (step **336**), receiving shell selection information (step **338**), identifying a set of second compatible hardware components, the set of second hardware components generated based on a compatibility between the second hardware components, the hardware component selection information, and the shell selection information (step **340**), and outputting the set of second compatible hardware components (step **342**). Process **330** may further include the step of providing an indication that the compatibility of a mobile phone shell with the hardware component selection information is dependent upon one or more criteria (step **340**).

Referring to FIG. **16**, a flowchart of a process **350** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **350** is shown to include the steps of receiving hardware component selection information (step **352**), receiving shell preference information (step **354**), identifying a set of mobile phone shells, the

set of mobile phone shells generated based on a compatibility between the mobile phone shells, the hardware component selection information, and the shell preference information (step **356**), and outputting the identified set of mobile phone shells (step **358**). According to various embodiments, the shell preference information may include a shell shape, shell style, and shell size.

Referring to FIG. **17**, a flowchart of a process **400** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **400** is shown to include the steps of selecting a mobile phone shell from a set of mobile phone shells (step **402**) and selecting at least one hardware component from a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **404**).

Referring to FIG. **18**, a flowchart of a process **410** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **410** is shown to include the steps of selecting a mobile phone shell from a set of mobile phone shells (step **412**) and selecting at least one hardware component from a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **418**). Process **410** may also include one or more of the steps of providing weight preference information (step **414**) and providing cost preference information (step **416**).

Referring to FIG. **19**, a flowchart of a process **420** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **420** is shown to include the steps of selecting a preconfigured mobile phone from a set of mobile phone shells, the preconfigured mobile phone including at least one empty portion configured to receive an interchangeable hardware component (step **422**) and selecting at least one hardware component from a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **424**).

Referring to FIG. **20**, a flowchart of a process **430** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **430** is shown to include the steps of selecting a mobile phone shell from a set of mobile phone shells (step **432**), causing an image of at least one hardware component from a subset of interchangeable hardware components to move form a first location to a second location, the second location corresponding to a portion within the selected mobile phone shell and the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **434**), and selecting at least one hardware component from a subset of interchangeable hardware components having different functions (step **436**).

Referring to FIG. **21**, a flowchart of a process **500** for selling a mobile phone is shown, according to an exemplary embodiment. Process **500** is shown to include the steps of offering to sell a hardware customizable mobile phone with one or more selectable hardware components configured to fit within a shell (step **502**), offering a plurality of selectable options for at least one hardware component configured to fit within the shell (step **504**), and receiving a selection of at least one hardware component configured to fit within the shell (step **506**).

Referring to FIG. **22**, a flowchart of a process **510** for selling a mobile phone is shown, according to an exemplary embodiment. Process **510** is shown to include the steps of offering to sell a hardware customizable mobile phone with one or more selectable hardware components configured to fit within a shell (step **512**), receiving prior user information (step **514**), offering a plurality of selectable options for at least one hardware component configured to fit within the shell (step **516**), and receiving a selection of at least one hardware component configured to fit within the shell (step **518**).

Referring to FIG. **23**, a flowchart of a process **520** for selling a mobile phone is shown, according to an exemplary embodiment. Process **520** is shown to include the steps of offering to sell a hardware customizable mobile phone with one or more selectable hardware components configured to fit within a shell (step **522**), offering a plurality of selectable options for at least one hardware component configured to fit within the shell (step **524**), and receiving a selection of at least one hardware component configured to fit within the shell (step **532**). Process **520** may also include one or more of the steps of offering a plurality of selectable options for at least one hardware component configured to fit within the shell based on manufacturing complexity (step **526**), offering a plurality of selectable options for at least one hardware component configured to fit within the shell based on availability of the hardware component (step **528**), and offering a plurality of selectable options for at least one hardware component configured to fit within the shell based on a rating of the hardware component (step **530**).

Referring to FIG. **24**, a flowchart of a process **600** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **600** is shown to include the steps of receiving from an end-user a selection of a mobile phone shell from a set of mobile phone shells (step **602**), sending to the end-user a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **604**), and receiving from the end-user a selection of at least one hardware component from the subset of interchangeable hardware components (step **606**).

Referring to FIG. **25**, a flowchart of a process **610** for customizing hardware for a mobile phone is shown, according to an exemplary embodiment. Process **610** is shown to include the steps of receiving over a computer network from an end-user a selection of a mobile phone shell from a set of mobile phone shells (step **612**), sending over a computer network to the end-user a subset of interchangeable hardware components having different functions, the subset of interchangeable hardware components generated based on a compatibility between the selected mobile phone shell and the set of available interchangeable hardware components (step **620**), and receiving over a computer network from the end-user a selection of at least one hardware component from the subset of interchangeable hardware components (step **622**). The process **610** may also include the steps of receiving over a computer network from the end-user a weight preference information (step **614**), receiving over a computer network from the end-user a cost preference information (step **616**), and receiving over a computer network from the end-user a selection of a preconfigured mobile phone from the set of mobile phone shells, the preconfigured mobile phone includ-

ing at least one empty portion configured to receive an interchangeable hardware component (step **618**).

It is also important to note that the construction and arrangement of the systems and methods as shown in the exemplary embodiments are illustrative only. Although only a few embodiments have been described in detail, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts or elements. It should be noted that the elements and assemblies disclosed herein may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Additionally, in the subject description, the word "exemplary" is used to mean serving as an example, instance or illustration. Any embodiment or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments or designs. Rather, use of the word exemplary is intended to present concepts in a concrete manner. Accordingly, all such modifications are intended to be included within the scope of the present inventions. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the preferred and other exemplary embodiments without departing from scope of the present disclosure or from the scope of the appended claims.

The present disclosure contemplates methods, systems and program products on any machine-readable media for accomplishing various operations. The embodiments of the present disclosure may be implemented using existing computer processors, or by a special purpose computer processor for an appropriate system, incorporated for this or another purpose, or by a hardwired system. Embodiments within the scope of the present disclosure include program products comprising machine-readable media for carrying or having machine-executable instructions or data structures stored thereon. Such machine-readable media can be any available media that can be accessed by a general purpose or special purpose computer or other machine with a processor. By way of example, such machine-readable media can comprise RAM, ROM, EPROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by a general purpose or special purpose computer or other machine with a processor. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or a combination of hardwired or wireless) to a machine, the machine properly views the connection as a machine-readable medium. Thus, any such connection is properly termed a machine-readable medium. Combinations of the above are also included within the scope of machine-readable media. Machine-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing machines to perform a certain function or group of functions.

Although the figures may show a specific order of method steps, the order of the steps may differ from what is depicted. Also two or more steps may be performed concurrently or with partial concurrence. Such variation will depend on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations could be accomplished with standard programming techniques with rule based logic and other logic to accomplish the various connection steps, processing steps, comparison steps and decision steps.

What is claimed is:

1. A mobile handheld-device platform comprising:

a generally rigid structure or housing configured to be grasped by a human user and including a plurality of hardware component receivers;

the plurality of hardware component receivers each configured to removably receive and electrically couple with a respective interchangeable hardware module selected from at least two interchangeable hardware modules; and

processing electronics including a communication module configured to communicate with an interchangeable hardware module removably received and electrically coupled with a respective hardware component receiver of the plurality of hardware component receivers,

wherein the plurality of hardware component receivers and the processing electronics have a bus modular architecture allowing the number and locations of interchangeable hardware modules electrically coupled with the plurality of hardware component receivers to vary,

wherein the generally rigid structure or housing forms a generally rectangular parallelepiped with a handheld form factor and having at least two hardware component receivers of the plurality of hardware component receivers located on a surface of a major side of the rectangular parallelepiped, and

wherein another at least two hardware component receivers of the plurality of hardware component receivers are located on a surface of another major side of the rectangular parallelepiped.

2. The handheld-device platform of claim **1**, wherein the processing electronics are integrated with the generally rigid structure or housing.

3. The handheld-device platform of claim **1**, wherein the processing electronics further include a memory and a processor configured to electronically interact with an interchangeable hardware module removably received and electrically coupled with a hardware component receiver of the plurality of hardware component receivers.

4. The handheld-device platform of claim **1**, wherein the processing electronics include a microprocessor, an application specific integrated circuit (ASIC), a circuit containing one or more processing components, a group of distributed processing components, circuitry for supporting a microprocessor, or other hardware configured for digital processing.

5. The handheld-device platform of claim **1**, wherein the generally rigid structure or housing and the communication module comply with a hardware component interchangeability standard.

6. The handheld-device platform of claim **5**, wherein the hardware component interchangeability standard specifies (i) a form or fit configuration describing the removable receiving between a hardware component receiver and an interchangeable hardware component, (ii) a dimensional or structural configuration-describing the electrically coupling between a hardware component receiver and an interchangeable hardware component, or (iii) a protocol for communicating with an interchangeable hardware component.

7. The handheld-device platform of claim 1, further comprising a first interchangeable hardware module removably coupled with a first hardware component receiver of the plurality of hardware component receivers, the first interchangeable hardware module selected from the at least two interchangeable hardware modules having different functions.

8. The handheld-device platform of claim 7, wherein the handheld-device platform is configured such that another first interchangeable hardware module selected from the at least two interchangeable hardware modules may be interchanged with the first interchangeable hardware module.

9. The handheld-device platform of claim 7, wherein the first interchangeable hardware module includes a third-party sourced first interchangeable hardware module.

10. The handheld-device platform of claim 1, wherein the plurality of hardware component receivers are each respectively configured to receive an interchangeable hardware module with an exterior surface of the interchangeable hardware module facing an exterior surface of the hardware component receiver.

11. The handheld-device platform of claim 1, wherein each interchangeable hardware module of the at least two interchangeable hardware modules has a generally rectangular parallelepiped shape, and the plurality of hardware component receivers are each respectively configured to receive an interchangeable hardware module with an exterior surface of a major side of the generally rectangular parallelepiped shape of the interchangeable hardware module facing the exterior surface of the major side of the generally rectangular parallelepiped of the hardware component receiver.

12. The handheld-device platform of claim 1, wherein the removably receive and electrically couple includes removably plugged in or electrically connected.

13. The handheld-device platform of claim 1, wherein the plurality of hardware component receivers are each configured to physically receive and removably electrically couple with a respective interchangeable hardware module.

14. The handheld-device platform of claim 1, wherein the removably receive includes physically inserted, installed, or snapped in.

15. The handheld-device platform of claim 1, wherein the removably receive includes physically supported.

16. The handheld-device platform of claim 1, wherein the plurality of hardware component receivers each include a socket configured to removably receive and electrically couple with a respective interchangeable hardware module.

17. The handheld-device platform of claim 1, further including an antenna, and wherein the antenna and the communication module are further configured to communicate with a wireless network.

18. The handheld-device platform of claim 1, wherein the plurality of hardware component receivers each include electrical contacts configured to electrically couple with corresponding electrical contacts of a respective interchangeable hardware module.

19. The handheld-device platform of claim 18, wherein the respective electrical contacts of the plurality of hardware component receivers include a standardized arrangement of respective electrical contacts.

20. The handheld-device platform of claim 1, wherein the communication module is configured to communicate with each hardware component receiver of the plurality of hardware component receivers using a standardized protocol.

21. The handheld-device platform of claim 1, wherein the communication module is configured to communicate with each hardware component receiver of the plurality of hardware component receivers and another component of the handheld-device platform.

22. The handheld-device platform of claim 1, wherein the handheld-device platform includes a mobile handheld-device platform.

23. The handheld-device platform of claim 1, wherein the handheld-device platform includes a mobile cellular telephone platform.

24. A mobile handheld-device platform comprising:

a generally rigid structure or housing configured to be grasped by a human user and including a plurality of hardware component receivers;

the plurality of hardware component receivers each configured to removably receive and electrically couple with a respective interchangeable hardware module selected from at least two interchangeable hardware modules; and

processing electronics including a communication module configured to communicate with an interchangeable hardware module removably received and electrically coupled with a respective hardware component receiver of the plurality of hardware component receivers,

wherein the plurality of hardware component receivers and the processing electronics have a bus modular architecture allowing the number and locations of interchangeable hardware modules electrically coupled with the plurality of hardware component receivers to vary, and

wherein a first hardware component receiver of the plurality of hardware component receivers includes a first dimensional or structural configuration allowing it to removably receive and electrically couple with one of a first group of the at least two interchangeable hardware modules but not with a second group of the at least two interchangeable hardware modules, and a second hardware component receiver of the plurality of hardware component receivers includes a second dimensional or structural configuration allowing it to removably receive and electrically couple with one of the second group of interchangeable hardware modules but not with the first group of interchangeable hardware modules.

25. The handheld-device platform of claim 24, wherein the first dimensional or structural configuration of the first hardware component receiver includes a standardized first dimensional configuration.

26. The handheld-device platform of claim 24, wherein the second dimensional or structural configuration of the second hardware component receiver includes a standardized second dimensional configuration.

27. The handheld-device platform of claim 24, wherein the first group of at least two hardware component receivers each have a substantially same dimension or structural configuration.

28. The handheld-device platform of claim 24, wherein the second group of the at least two interchangeable hardware modules each have a substantially same dimension or structural configuration.

29. The handheld-device platform of claim 24, wherein two first hardware component receivers of at least two hardware component receivers are located adjacent on a surface of the generally rigid structure or housing.

30. The handheld-device platform of claim 29, wherein the two adjacent hardware component receivers are configured to respectively receive one third-interchangeable hardware module having a third dimensional or structural configuration providing a removable receiving and electrically coupling with the two adjacent hardware component receivers,

wherein the third-interchangeable hardware module is selected from the at least two interchangeable hardware modules having different functions.

31. The handheld-device platform of claim **24**, wherein the first hardware component receiver is disposed at least partially in a first portion of the generally rigid structure or housing and the second hardware component receiver is disposed at least partially in a second portion of the generally rigid structure or housing; and

wherein the first hardware component receiver and the second hardware component receiver are configured such that a third interchangeable hardware module may be exchanged with the first interchangeable hardware module and the second interchangeable hardware module such that the third interchangeable hardware module is disposed within a combination of the first hardware component receiver and the second hardware component receiver.

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